AUTOMATION IN THE LIBRARIES OF INDIAN INSTITUTES OF TECHNOLOGY

A STUDY OF RETROSPECTS AND PROSPECTS WITH EMPHASIS ON SYSTEM - DESIGN AND COST-BENEFIT ANALYSIS

Thesis Submitted for the award of the Degree of

DOCTOR OF PHILOSOPHY

IN

LIBRARY AND INFORMATION SCIENCE

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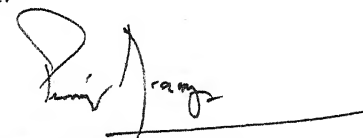Bundelkhand University, Jhansi

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CERTIFICATE

This is to certify that the work embodied in the thesis entitled "Automation in the Libraries of Indian Institutes of Technology : A study of retrospects and prospects with emphasis on System Design and Cost-Benefit Analysis" is submitted by Shri Ved Prakash Khare, Sr. Lect., Department of Library & Information Science for the award of the degree of Doctor of Philosophy in Library & Information Science. It is a record of the bonafide research work carried by him under my supervision and guidance. This work has not been submitted elsewhere for a degree/diploma in any form.
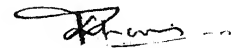
It is further certified that he has worked with me for the period required under the Ph.D. degree, ordnance –7 of the Bundelkhand University, Jhansi.

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DECLARATION

I declare that the thesis entitled, *"Automation in the Libraries of Indian Institutes of Technology : A study of retrospects and prospects with emphasis on System-Design and Cost-benefit analysis"* is the result of my original research conducted under the supervision and guidance of **Prof. M.T.M. Khan**, Head, Deptt. of Library and Information Science, Bundelkhand University, Jhansi. The work reflects an advancement in the discipline of Library Automation.

I further declare that to the best of my knowledge and belief the thesis does not contain any part of my work, which has been previously submitted in part or full for any diploma or degree to any University.

(Ved Prakash Khare)

CONTENTS

PREFACE

The civilization has moved from an industrial society to a post-industrial society where information is the key economic resource. The modern society can also be called as Information Society. The information now has become not only an inevitable but also the fourth dimension of the society. To have a control over information the Libraries and Information centres play a vital role. However, the exponential growth of information and demand for speed and accuracy have forced to implement automation in management of library services.

Indian Institutes of Technology are being considered to be on the apex of academic institutions in the discipline of Science and Technology. Their libraries are rich in collection and possess variety of information sources. The users of these libraries i.e. students and faculty members are crazy to seek their desired information / document without wasting even a few minutes, also the quantum of users is huge. The libraries are well funded and normally money is not a hurdle to introduce new services or techniques. The staff in library, though efficient and good in number but the ever-increasing work load had put a big challenge before them. Automation of library has come to rescue the library staff.

Implementing automation in libraries is not an easy task, because the activities and services within a library have steps different from one another and each of the step may have number of variables. System – Design, therefore, is very crucial in Library Automation. The cost of computerisation and the benefits being accrued from it is another consideration in the decision-making of Library Automation.

In the present study the concentration is on the state of art of automation in the libraries of Indian Institutes of Technology, Systems used therein and the costs and benefits in this behalf.

Chapter – 1 is the introductory chapter of study. After brief introduction of automation and Library Automation, feasibility of Library Automation is being introduced. Next, scope of this study is being highlighted which is followed by the Hypothesis. Methodology, being used to make this study, is through questionnaire, observations by personal visits and search of literature on the topic.

Chapter – 2 reflects the vastness of IIT libraries and the variations among different Libraries. The collection details, users' details and details of Library staff have been summarized in Table 1, 2 and 3 respectively. After this the organisation of these Libraries and services extended by them are being described.

Chapter – 3 covers the general aspects of system selection. It also describes the design for various house-keeping routines of Library, Indexing and Formulation of Bibliographical Data Base. Detailed programs and flowcharts are given which may prove useful in developing new softwares.

Chapter – 4 gives elements of system and then studies Hardware, Software and Humanware in the libraries of Seven IITs.

Chapter –5 covers briefly the aspects of cost-benefit analysis in libraries and the problems faced in calculating the benefits. Available data is being analysed and calculation of benefits presented.

Chapter – 6 contains the conclusion of this study. In order to test the formulated hypothesis the findings of this study are being analysed. At the end a few suggestions have been made for automating other libraries and for future research.

ACKNOWLEDGEMENT

I express my sincere thanks and gratitudes to the authorities of Bundelkhand University, Jhansi to allow me to get enrolled for my Ph.D. and to approve the topic. Being in profession for last more than two decades it was an expectation from my colleagues, friends and family members that I should complete my research work. Finally in 1996, my senior colleague and Head of the Deptt. **Prof. M.T.M. Khan** *most kindly indeed insisted that I must do my research under his supervision .I am enough lucky to have a supervision like Prof. Khan because he not only guided me but also helped me to collect data from IIT, Roorkee and IIT Guwahati. I must confess here that my work was delayed by almost two years for non-availability of data from IIT, Guwahati. Prof. Khan, using his personal contact solved my problem. He always advised me to expedite the work. I am obliged and grateful to Prof. Khan for his brotherly guidance, help and valuable advices.*

I am thankful to the library staff of all the seven IITs, in general and to **Dr. H.S. Waydande** *of IIT Mumbai,* **Dr. Bhooshan Lal** *of IIT Kanpur and* **Dr. S.P. Singh, Dr. J.C. Arora** *and* **Mr. J.P. Srivastava** *of IIT, Delhi in particular for their support during my visits to their libraries.*

I am indebted and obliged to the **Hon'ble Vice-Chancellor Sir** *of Bundelkhand University, Jhansi who inspired me by his work and words to complete this work and has most kindly extended the time of submission. During last one year, the great young scientist shown his concern in this behalf and I give full credit to the* **Hon'ble V.C. Sir** *for completion of this work. The other sources of my inspiration are the members of my family,*

*specially my mother and elder brother **Dr. O.P. Khare**, a renowned endocrinologist of Delhi. I am grateful to them and to other members of my family for their valuable co-operation. I am grateful to respected **Prof. H.S. Sengar,** whose kind advice helped me to finalise the topic of this research work. I am thankful to all my colleagues, friends and well wishers who directly or indirectly helped me. I also thank my past student Mr. Firoz Khan for typing this work neatly and correctly.*

Last but not the least I thank to the office staff of Bundelkhand University and all those whose names could not be included.

(VED PRAKASH KHARE)

TABLES

LIST OF FLOWCHARTS

INTRODUCTION

In recent decades, particularly after the two world wars, civilization has moved from an industrial society to a post –industrial society. In this society, Information is the predominant element than more industry and much of the labour force is working in this sector. The post industrial society thus can be called as information society. In such a society, capital alone does not ensure productivity, instead information is the key economic resource. Information, the self –regenerative resource is today the fourth dimension of society (other than 3 ms i.e. money, material and men). In order to gear up our control over information, the Libraries and Information Centres have become an inevitable part of the society. The Public Libraries at the various levels of the society to cater to the information needs of every citizen. The Academic Libraries to feed information to the students and teachers for their different academic pursuits and the Special Libraries to organise and disseminate information to the decision makers and scientists etc. to obtain the goals of their parent organisations. However, the exponential growth of information and demand for speed and accuracy have forced to implement automation in management of library services.

1.1 What of Automation?

The term automation has been described in literature in various contexts leading to different meanings. This term was first used by Mr. D. S. Harder of General Motor Company (USA) in 1836 and he defined automation as "the automatic link of parts between progressive production processes in relation to engineering industries". Since then the term has been applied to a wide variety of automatic

machineries and systems and is commonly used to describe any operation in which there is substantial substitution of controlled actions of human efforts or intelligence. The term automation is being defined as follows in some of the recognized sources:-

"Automatic control of an apparatus, process or system by mechanical or electronic devices that take place of human organs of observation, efforts or decision" – Third New Webster's English Dictionary

"Production system so integrated that materials move through the required operations with little or no human assistance". – McGraw-Hill Encyclopaedia of Science and Technology.

"The term automation is used in automatic manufacturing, control system, computing machinery or equipment that reduces the participation of human labour in production or services." – New Encyclopaedia Britanica.

On the basis of the definitions of automation the following may be considered to be its essential characteristics-

i.   The operations of processes are carried out automatically.
ii.   Avoids or reduces human actions and thus saves labour.
iii. Increases accuracy and quality of work.
iv.   Increases efficiency and speed-up the operations.

1.2 Library Automation

The phenomena of mechanisation of traditional library activities, such as acquisition, serial control, cataloguing, circulation control etc., was called library

automation. Today, the term Library Automation is used extensively to refer primarily to the use of computers to perform the library activities. In recent times the topics like computerised Information Storage and Retrieval, semi-automatic/ automatic indexing, networking of automated systems were also treated as a part of Library Automation. Though telecommunication plays a vital role in automatic information storage and retrieval in general and for networking in particular but this study is restricted to the use of computer-system for various library activities i.e. house keeping routines, information storage and retrieval and networking.

The history of automation begins from 1880, when Hollerith invented the punched card for tabulating the census figures. The University of Texas was perhaps the first to use these punched cards for circulation control in 1942, the Montclair Public library in New Jersy installed two specially designed book charging machines for recording individual transactions automatically on punched cards. The library of congress used the Unit Record Machines for the production of catalogue cards for the first time in 1950. In this era, until 1950's, the speed of operations, the capacity for manipulation and analysis of data were very limited.

In the second era of Library Automation during 1960's general purpose computers became available for performing traditional library activities. A few important developments of this era are : MEDLARS Project of National Library of Medicine, USA ; computerised serial control at Southern University of California at San Diego, computerised circulation system at Southern Illinois University at Carbondale; computerised book catalogues for five new university libraries at Ontario at University of Toronto; and initiation of MARC Project.

The next era of library automation began with the success of MARC and INTREX (Information Transfer Experiment) projects. In 1967 on-line systems like OCLC (Ohio College Library Centre) and BALLOTS (Bibliographic Automation of

Large Library Operations using a Time-sharing System) started functioning. In the early 1970's, on-line systems were in operation in several libraries viz. Bell Telephone Laboratories and Eastern Illinois University had on-line circulation system, Larel University at Quebec had an on-line serial control system and Washington State University had an on-line acquisition system. Library Automation in the early 1980's entered into the modern era, wherein the microcomputers are being used extensively for library operations.

After reviewing the history of Library Automation it would be rational to have a look on development of library automation from system's angle. The first stage of development could be dated back to 1960's which saw libraries beginning to utilize the resources of mainframe computers and the data processing staff. Punched cards were used to record transactions such as circulation .A number of libraries developed computerised circulation system based on Batch-Processing techniques. The library functions automated were clerical type. Computation capabilities had developed but not so for storage. Stress was on utilizing automated technology for increasing efficiency of unit operations. Technology was still not at the informating stage.

The second stage of Library Automation begins with the development of comparatively low-cost mini-computers, which had moved beyond Batch-Processing capabilities and the need for punch cards. The computes of this age were capable of handling several tasks simultaneously and could accommodate rapid access and large capacity storage devices to support on-line activities. The new circulation system provided useful reports with valuable and up-to-date information about patron activity, item usage and others. From these data, library operations could be streamlined leading to better resource management. At this stage the technology had moved beyond codifying separate activities or procedures to a more comprehensive system. Access to stored data meant access

to far more than discrete pieces of information. Also through the early 70's, fee-based search services, operated by the producers of machine readable databases or other organisation like large research libraries, became available. This was possible because of exponential growth in storage capacity.

In the third stage micro computers are getting linked to one another so that they can be used independently or in conjunction with databases. These systems can also be linked to external databases and communication networks. At this stage as Information Technology restructures the work situation, it abstracts thought from action. The abstraction, explicit inference and procedural reasoning combined together, in micro computers, result into a set of competencies that 'Zuboff' called intellective skills. The informating process takes learning as its pivotal experience. Its objective is to achieve the value that can be added from learning in the situation Information Technology in its first stage helped in automation while now in its third stage it is entering information stage. The activities associated with both automating and informating represent intellectual efforts, but their objectives and the nature of the organisation processes, they entail, are different. Automation preserves what is already known, it treats as negligible the potential values to be added from learning that occurs in the living situation. The informating organization uses technology to do far more than routine jobs. It uses the new technology to increase the intellectual content of work. This is knowledge management. At this stage the information personnel / librarians have to act as consultants and educators, maintain the reliability of the database, improve its breadth and quality and develop approaches to system design.

Ref. – Zuboff (s) – "In the age of the smart machines : the future of work and power :- Newyork : John Wiley, 1958 P. 76.

1.3 Why of Library Automation ?

Information is now considered as important resource for socio-economic development of society. Information is the key-element that marks the difference between the highly developed and the developing societies in the world. The wavering information explosion has created problems in proper handling of information. At present there are approximately 24 million of publications and if each paper runs for 10 pages and for each paper 10 copies are maintained there will be more than 2 billion sheets of paper for storage. The quantitative growth of scientific and technical information is accelerating exponentially i.e. the volume is swelling by about 10 percent annually due to the multiplication of disciplines, their marked specialization and interdisciplinarity. The generation of voluminous information has become a great challenge for the libraries and information experts. Therefore, Automation of library services is imperative for efficiency and effective working of a library system. For efficaceousness and economy of library systems Automation is meaningful. 'Kimber' says "Library is no different from other office or factory considering the use of computer to perform a given job of work most economically, where the difference does arise, however, is in the concept of library services."

Automation of library facilitates more accuracy and efficiency and library staff finds considerable support of equipment used in automation in their routine work performance. Manpower is an essential input in all organizational activities. The manpower when disciplined to creativity becomes human resource. The development and efficiency of a library depends upon mainly on human resources, collections and other facilities. Human resource is an important component and

KIMBER (Richard T) – Automation in Libraries – Oxford : Pergamon, 1968. P.1.

plays a vital role. The success of any automated library depends upon human resource in terms of available skilled manpower for designing, operation and implementation.

The following factors have necessitated Library Automation –

a) Information and literature explosion.
b) Emergence of new techniques.
c) Depth of content-analysis, selection and manipulation.
d) Immediate access to specialized information.

The automation in libraries has become necessary due to multi-dimensional development of activities and ever-increasing work load. Hence to keep the house-keeping routines up-to-date and clear-up the pending jobs Library Automation has become a must. Through automation various jobs can be done with great speed and accuracy. Computers can easily handle and cope-up with the ever-increasing work load of libraries. They can be used mainly for two types of jobs, i.e. a) House – keeping routines and b) Information services.

Under house-keeping routines falls jobs like ordering of documents, acquisition, classification, cataloguing, circulation control, serial control and maintenance of statistical and other records important from the angle of management. With the use of computers for routine jobs better and quick services are assured. Under information services computers are used for generation and collection of information, Information Retrieval, Current Awareness Services (CAS), Selective

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WALIA (Meena) and AGRAWAL (SP) – "Human Resource Development : Information and Library profession in India." Proceedings of Seminar on Library and Information Manpower Development (1988: Nagpur University) P.10.

Dissemination of Information (SDI), consultation of data bases, information transfer etc. During last 4-5 decades it has been experienced that by using computers, the libraries could achieve better standards, efficient organisation, better control on collection, best co-operation & co-ordination and improved services.

To emphasise the need and objectives of library automation, the opinions of some eminent library scientists, quoted below –

Jessey H. Shera lays stress on "the use of machines in libraries is a solution to the problems of staff and storage and result in reduction of mistakes. A high speed and better quality of tasks in less time is assured.

G.M. Taylor mentions library automation as "more items at less cost".

Jahoda & Accola are of the opinion that automation in library operations reveals improvement in services and savings in certain personnel and others. The speed and accuracy, better control of records, their uptodateness and elimination of duplication of work are the other specialities. They also opined that it will be more advantageous if machine is used for variety of purposes and cost is shared by several libraries.

T. Stein :- is of the opinion that the cost of machine and its operation is very high and that automatic search of information is much more costly than the conventional methods, therefore time – sharing methods and operating the machine on loan or rent is being recommended.

B.C. Vickery :- opines that library automation has following three aspects –

a) Replacement of human-brain and manpower by machine for routine jobs.

b) Automation is economic only when there is a continuous flow of information to be manipulated.

c) Automatic information processing operates at a very high speed and it is very economic if a large quantum of information is to be manipulated.

However, the objectives of library automation can be concluded as follows –

1- Easy Functioning :- Several jobs which are tedious and time-taking, if done manually, can be performed easily by using computers.

2- Accuracy – To error is human nature, also their decisions may be affected by a number of factors e.g. economical, social, psychological or environmental and hence every possibility of a mistake. Through automation chances of mistake are eliminated or reduced to minimum.

3- Promptness in Service :- Some jobs like stock- verification, compilation of union catalogue and / or bibliographies, if done manually may take months or even year / years. Such tasks can be done by computer in a short time.

4- Economy – The use of computer saves human labour, money and time and thus results into great economy.

5- Elimination of Duplication in Work – The information fed in computer once can be used and manipulated for various purposes and thus duplications is avoided.

6- Better Services and Ready Access to Information – Through computers, users are served with their desired information immediately. The search for desired specific information which is tedious and time-taking job for human beings can be done within a few minutes by computers.

7- Great speed in manipulation of data - If the same information has to be used for various purposes, in a manual system it is a slow and tough task but in Data Processing System its speed is very high.

1.4) Scope of Library Automation :

Despite of the above descriptions, the concept of Library Automation would not be very clear unless the areas or library activities, wherein computers could be used efficiently and effectively, are being identified. The scope of library automation is being described by some eminent scholars in the following words –

Dr. Jessey H. Shera laid emphasis on the use of machines in libraries particularly for bibliographic and indexing operations. Further comments that "Automation has already proved itself an effective means for facilitating certain types of bibliographic and indexing operations."

Dr. S. R. Ranganathan Experimented automation in classification, circulation, information retrieval and reprography at DRTC, Banglore. In his opinion, "Mechanization is time saving device and can be applied if economical to circulation of books and Information Retrieval".

Jahoda & Accola : have observed by making survey that automation is applicable and truthful in acquisition work bibliographies, budget record, cataloguing, circulation control, serial control and binding record.

H. L. Griffith has divided library data processing into three groups-
    a) House keeping functions.
    b) Information dissemination.
    c) Retrospective searching.

D. Melchar observes that automation is not only used in clerical jobs but also in publishing notable type of composition, indexing, directory compilation, S.D.I. and machine translation.

E.V. Christeansen recommends that Library Automation may have two areas of application for special libraries-

 a) actual application of automation derived from its use.
 b) Intellectual application of automation.

He further suggested the following three areas of library activities in which automation can be applied-

 i.)   Organisation of activities.
 ii.)   Dissemination of current information.
 iii.)   Information retrieval.

Through these areas overlap yet automation is applicable in disseminating the information, preparation of bibliographies, abstracts, regular acquisition slips and indexing.

1.5. Activities to be Automated :

The various activities to be automated in a library may be summarized as follows-

A) Acquisition work:-
    A1) Ordering work:-
        A11) Preparation of order slips and cards.
        A12) sending orders to vendors.
        A13) Updating the record file.

A2) Recording work-

    A21) Verification of books according to order file and bill file.

    A22) Printing out the lists of documents received and documents not received.

A3) Maintenance of accounts:-

    A31) Income, expenditure and balance of allocated part.

    A32) Budget control.

B) Cataloguing :-

B1) Preparation of catalogue cards.

B2) preparation of authority file/subjects headings' list.

B3) Arranging of catalogue cards into a desired sequence.

B4) Preparation of shelf list.

B5) Preparation of list of items catalogued.

B6) preparation of list of holding or printed catalogue cards (for use in centralized and co-operative cataloguing)

B7) Compilation of union catalogue

C) Circulation control:-

C1) Registration of members.

C2) Issue of borrower's cards.

C3) Charging of documents.

C4) Discharging of documents

C5) Updating record files.

C6) Reminders for overdue.

C7) Maintenance of Statistics.

C8) Information Retrieval i.e. which books are issued to whom? How many books issued to any individual and date of return?

C9) Inter Library Loan.

D) **Serial control**

> D1) Ordering work
>
> D2) Recording work
>
> D3) Updating the recording file
>
> D4) Reminders to vendors and publishers
>
> D5) List of serial in binding
>
> D6) List of holdings
>
> D7) List of new additions.
>
> D8) Any other information.

E) **Documentation and Information Retrieval**

> E1) Indexing of micro and macro documents.
>
> E2) Preparation of Thesaurus.
>
> E3) Abstracting.
>
> E4) Searching and print out of answers to the queries.
>
> E5) Preparation and updating of database.
>
> E6) Selective Dissemination of Information service
>
> E7) Current Awareness Service.
>
> E8) Preparation of Documentation Lists/Bibliographies.

F) **Stock verification**

> F1) Preparation of list of accession numbers of the total documents accessioned in the library.
>
> F2) Preparation of list of accession numbers of documents available in the library.
>
> F3) print out of list of accession numbers of missions documents.
>
> F4) print out of list of missing documents with full bibliographical descriptions.

Besides the above, efforts are in progress to computerize the most intellectual activities like classification of documents and the day is not far when using computer systems with artificial intelligence and a very large internal memory, all the activities related with jobs and services of libraries would be fully automated.

1.6 FEASIBILITY OF LIBRARY AUTOMATION :

Although the history of automation, in general, and that of library automation, in particular, is not very old but the developments in this field are very rapid. The ever increasing workload in libraries due to manifold increase in number of documents and users, the overall change in concept of librarianship, and the specialized services of the micro-nascent thought form inside as well as outside the library are the factors which forced library staff to use machines i.e. computers for their rescue to keep pace with these factors. Also the developments in electronics which resulted into availability of fast computers and personal computers, comparatively at a very low price, has made it possible to use computer in libraries. But inspite of these factors the computerisation may not be useful or beneficial in all the libraries. Before taking a decision to computerise a through study should be undertaken to ascertain its feasibility in terms of time, finance, staff, user's level, infrastructure and other possible constraints.

Library Automation is a major undertaking which requires a positive operational justification, an examination of the pros and the cons and a realisation that it will in the course of time, change the whole nature and approach of the library. Whether that change will be for the better or worse will depend on three things; how the introduction was undertaken, how reasonable were the original projections of what could be accomplished by the use of computer; and how realistic were the objectives in library terms.

The initial impetus for the introduction of a computer is often the existence of a problem area where the service does not match the standards the librarian wishes to reach. However, computers are not magic. We do not change a library with serious operational problems into a place where all readers receive all the books they want in what they regard as a reasonable time just by the wave of light pen wand. The touch of a computer will not turn frogs—into princes. Some of the failing of a library may be solved, or alleviated, by the use of a computer, others will simply be automated and produced in milliseconds rather than minutes or hours. Here it is always to be remembered that the universe works in a balance, and what we take off one side we have to put on the other. Thus it should not be surprising to find that for every saving made by a computer something has to be put on the debit side.

It is important to know what computers can and cannot do. They can count far quicker than the average human; they can compare strings of numbers or letter and put them in ascending or descending order; they can search for a particular set of characters in the data they hold. If they have a built in clock, they can be told when something should happen, and report on whether it has or has not.

However, the feasibility of computerisation should be studied by a team comprising some library experts and some relevant computer expertise. The team initially should study the existing systems and then visit some similar libraries being already computerized. This would give a clear and comparative picture of merits and limitations of the system already installed and used practically. The team should also study the latest hardwares and softwares available in market, because the developments in these disciplines are very fast and latest systems and softwares obviously have an edge over the previous ones.

India being a vast country with drastic diversities, and old cultural heritage and ocean of knowledge has a very large number of libraries ranging from a tiny one (having a few hundred documents housed in a couple of almirahs within a small room) to the giants (having millions of documents housed in a multistoreyed building having several thousand ft^2 carpet area. Also that some have only a few hundred users in one whole year while the others have more than thousand users per day. Due to this diversity any general study for feasibility of computerisation of libraries may not be possible al all. Though for almost last two decades computerisation of libraries has remained a burning topic among the professionals (librarians) and teachers and from ordinary citizens to the top level executives and policy framers in the government but as yet only a small fraction of total libraries could be computerised. The reasons behind the slow progress in this behalf seems to be as follows-

(1) most of the very large and old public and academic libraries which are very rich in collection, heavily used and have a huge quantum of work, but due to lack of essential infrastructure like availability of computer system, trained staff, awareness of users and above all desired funds etc. could not go for practical computerisation.

(2) On the other hand the special libraries which already have or can easily afford to have the desired infrastructure i.e. well trained and competent staff, well aware users and funds etc. have a very limited number of a regular visitors, small number of staff and limited (only selected) collection. Also the clienteles

ASHWORTH (John H) – "Cost effectiveness in Library Automation". The application of inexpensive minicomputers to information work – London : ASLIB, 1978.

and their specific topics of interest are so well known to the library staff that the need for automation has not been given a serious thought.

The major problem areas related to computer applications are : hardware, software, power failure, time –sharing, virus, manpower training etc. Libraries in India are today facing difficult challenges as they attempt to automate. Like their counter parts in other countries Indian libraries face these challenges at time when financial resources are dwindling and the costs of automated systems are increasing. The opinions regarding library automation runs from trumpeting automation as the beginning of a new age era of universal access and enlightenment to assertions of an orwellian—society finally coming to pass. Librarians will either become the new high priests of the information age, or they will soon be standing in welfare lines filling out job applications [1].

It is for these reasons that in Indian libraries the beginning of automation took place from those belonging to large and specialised organisations viz- Oil and Natural Gas Commission (ONGC), Indian Institute of Science, Banglore, Indian Statistical Institute, Institutions of Indian Council of Agricultural Research, (ICAR), Indian Council of Medical Research (ICMR), and Council of Scientific and Industrial Research (CSIR), Indian Council of Social Science Research (ICSSR), INSDOC, DESIDOC, Indian Institutes of Management (IIM), Indian Institutes of Technology etc.

1.7 SCOPE OF THIS STUDY :

As is known well Indian Institutes of Technology happen to be the pioneering centres for advanced technical education and research in India. The first IIT was founded in 1950 in Kharagpur (WB) with the assistance of UNESCO. Later IIT, Bombay (now Mumbai) in 1958, IIT, Madras (now Chennai) in 1959, IIT Delhi,

in 1960 and IIT Kanpur in 1961 were established though Russian, German, British and American Collaboration respectively. Lately in 1994 the sixth IIT is founded in Guwahati to cater to the needs of north eastern part of India and in 2001 University of Roorkee is being enhanced by Ministry of HRD as IIT, Roorkee. At present all the seven IITs are being founded and governed by the Government of India. The IITs have excellent infrastructure for conducting research as well as implimentation of latest techniques. The funds are ample i.e. adequate recurring grants from Government. of India and non-recurring funds under several projects. Time to time financial assistance is received from national and international organisations and industrial enterprises also. IITs possess a huge team of specialists and scholars of international repute in different disciplines of Science, Technology and also Humanities. The institutes are equipped with the best machines and computer system. Besides having the money, manpower, machines and materials these institutes also have the last of 5Ms i.e. Market of excellence. Here the term market is used in context of clientele of library's resources and services. The students doing B.Tech., M. Tech. courses are selected on All-India level competitions i.e. JEE and GATE respectively and hence obviously the cream of intellectuals. They are very sincere, disciplined and have a quest for knowing more and more. They are also most co-operative to the library staff. The faculty member are of very high calibre and are authorities in their disciplines. The over all environment of these institutes is very systematic, disciplined and most favourable for academic and research pursuits. Thus it can be said that the IITs have the best suited infrastructure for automating their libraries work and services.

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1. MENDELSOHN (Henry N) – "Services of Automated Libraries : Challenges and opportunities". IASLIC Bulletin, 42 (1), March 1997. P. 27.

I was fortunate enough to begin my career as Professional Assistant in IIT, Mumbai and put my services in central Library from 1979 to 1985. I also had opportunities to visit personally the libraries of Indian Institutes of Technology at Kanpur, Delhi and Chennai. My this affinity to IIT's forced me to take up this study.

In this study an attempt is being made to analyse the State of Art of Automation in IIT libraries. The systems and programs used by these libraries are given special attention. The other aspect studied is the cost benefit analysis or cost – effectiveness of automation. Though this aspect is very difficult to analyse for the reason that libraries are non-profit making organisations and benefits or effectiveness can not be measured in terms of money. Hence savings in terms of time and staff and improvement in quality of services has been considered to assess the effectiveness. This study may be useful for those large and medium sized. Libraries who are planning or in the process of automating their services and routine job. They may be able to make a feasibility study of automations, get the guidance in selecting suitable systems i.e. hardware, software and humanware.

1.8 HYPOTHESIS & METHODOLOGY :

In the present age of Information and Computerisation most of the large and medium sized libraries of India are striving for automation. The ever-increasing work-load. The limited number of staff and demand for more and more new information services within a very short span of time is one force in favour of automation. The other force is that automation or use of computer services has become a status symbol for any organisation. An executive, who has no e-mail address on his/her visiting card, and a library not having its website and internet connection, is being looked down by the contemporary persons/organization. The number of such libraries may be very large which wish to use computer for their

routine work and services but do not have concrete ideas about what can be automated, how can be automated and who would automate? The marketing personnel and advertisement go on trumpeting merits only of their particular products, but it is very difficult to take the crucial decision of choosing the hardware and system of the suitable capacity. Similarly number of software packages are available in market, but most of the library personnel do not have enough knowledge that which particular software would be suitable for which operations as well as economic and easy going with their requirements and available infrastructure.

The libraries of IIT's do not have uniformity as far as automation is concerned. Some has computerised a few house keeping routines other have got some different job routines automated. Also there exist lot of variations in the programme packages developed in house by each IIT. The idea behind taking this study is that the results would prove helpful to the libraries which are in the process of planning for automation. The study of systems being used in IIT libraries as well the benefits accrued from them would give guidance to other libraries. A particular IIT library, if has developed and used an ideal software for particular operation, the same may be used by other IIT libraries too. This may lead to uniformity in libraries of different IITs. All the IITs have worked and experimented individually and independently for the automation of their library operations and services. By a close analysis of their individual achievements, something better may come out. The study of cost benefits may help other libraries to decide if they should go for automation or not; and if yes then at what cost?

The methodology used for this study is through questionnaire (sample appended). The libraries of IIT, Delhi, Kanpur and Mumbai had been visited personally. The staff members were consulted and important data collected. The system had been studied personally and their functioning was observed. The staff of these libraries

had been co-operative enough and helped me in the study by providing not only desired information but also some documents related to the hardware and software used. The books and articles published in various journals on the topic as well as reports of IITs were consulted to frame the study. Thus the methodology used is a combination of survey of libraries personally and gathering information through questionnaire and literature available on the subject.

ORGANISATION OF LIBRARIES OF INDIAN INSTITUTES OF TECHNOLOGY

2.1 Collection :

To visualise the force behind automating the library services it would be worthwhile to study the resources available therein. As the five IITs i.e. situated at Kharagpur, Mumbai, Chennai, Delhi and Kanpur have passed through above four decades their resources are very rich. The sixth one at Guwahati is comparatively new i.e. established in 1994 has a smaller collection but the university, of Roorkee, which is being declared as 7th IIT in 2001, was established in 1847 and so its library collection is at par with the collection of other IITs.

TABLE - 2.1

Shows the collection details as on 31.3.2002.

S N	Name of Item	IITKH	IIIM	IITC	IITD	IITK	IITG	IITR
1.	Books	2,18,753	2,57,549	2,07,348	1,95,324	2,17,802	30,000	2.65,4?
2.	Periodicals (Current)	887	1,224	850	856	1,000	700	450
	a. Subscribed	837	1,111	750	806	900	654	352
	b. Gratis	50	113	100	50	100	46	48

3.	Back volumes of Periodicals	86,302	90,209	77,281	81,532	1,05713	20,000	40,000
4.	Standard Patents	18,513	23,642	17,285	27,217	22,512	1,000	2,000
5.	Microforms (Films & fiches)	6,213	5,721	2,018	1,226	8,245	500	NA
6.	Technical Reports	NA	41,605	18,560	21,542	52,382	NA	11,500
7.	Video Cassettes	228	219	252	425	254	-	-
8.	CD-ROM	12	79	16	47	35	500	915
9.	Motion pictures	33	NA	NA	11	NA		

Table 2.1 – Collection details : NA – Data Not Available separately

IITKH - IIT, Kharagpur; IITM – IIT, Mumbai, IITC-IIT, Chennai; IITD – IIT, Delhi; IITK – IIT, Kanpur; IITF, G- IIT, Guwahati; and IITR – IIT, Roorkee.

The table shows that the libraries under study are rich in documentary resources to cater to the needs of their students, faculty, and research scholars. On an average the number of books alone exceeds 2 lacks. The periodicals subscribed to have a varied periodicity ranging from weeklies like Chemical. Abstracts and Current Contents (all parts) to bi-enniels. The number of periodicals quoted does not include magazines like Times, News week, India Today etc. Besides the journals subscribed, to the libraries receive on an average 100 titles of journals as gratis i.e. received as gift or against exchange from the professional associations or other Research and Development organisations of different countries. They purchase standards from Bureau of Indian standards. British Standards Institution, German Standards (DIN) and International Standards Organisation. Large number of patients also purchased from several countries. Standing order is placed for

Technical Reports of NASA (National Aero. Space Administration, ASM (American Society for Metals), ASTM (American Society for Testing Materials) etc. The table also shows varied nature of documents procured.

2.2 Users :

The libraries under study are heavily used. They have to be kept open on 362/363 days in a year (excluding only 3 National Holidays) and on a normal working day they remain open for 15-18 hours. It becomes obligatory on part of these libraries to put so many working hours because the users are not only large in quantity but also equally giants in quality. The quest for knowledge and high level academic environment makes it mandatory for students and teachers to visit library almost everyday and spent a few hours in it.

TABLE - 2.2

Picture of number of users with their varied nature

SN	Category	IITKH	IITM	IITC	IITD	IITK	IITR	IITG
1.	U.G. (under – Graduates)	2,193	2,059	1,983	1,869	2281	16,00	477
2.	PG (Post- Graduates)	697	973	1,124	862	1,563	1,326	221
3.	Research Scholars	713	781	804	651	535	268	87
4.	Teaching Faculty	466	442	402	552	398	300	95
5.	Non-	975	1034	893	796	1771	340	151

	Teaching Staff						
6.	Others (Corporate members from Industries, Institute's Alumni and Retired Teaching & Non-Teaching staff i.e. EIM)	405	393	387	530	184	024	78
7.	Visitors Approx	1000	3984	2058	1240	150	800	560
	Total	6,449	9,666	7,648	6,500	6782	4,658	1,669

Table 2.2 Number of Library Users -

The above table shows that all the libraries have a large number of users. While IIT, Guwahati has the smaller member i.e. Approx 4,700 IIT, Mumbai has the largest number i.e. 9,666. This big difference in number of users in because IIT Guwahati was established lately i.e. in 1994 while the other IITs came into existence in 1950's and early 1960's. The other reason is that Mumbai is a city of industries and have head offices of the large number of National and Multinational business houses. Also Mumbai's city culture is of awareness, a common man is keen to be well informed, to the extent that even a taxi-driver will seldom miss to read a daily newspaper. The other cities like Kanpur, Kharagpur, Delhi & even Chennai lacks this culture and the executives from Industries and business houses are not frequenters in the libraries of these IITs like IIT, Mumbai.

2.3 Library Staff :

The libraries of all the IITs, have good number of staff, but as compared to the huge collection, large number of users and the variety of services offered by them it is not possible to manage the house keeping routines and users services manually. It has, therefore, became imperative for these libraries to go for automation. The following table gives a brief account of the manpower available in the libraries of IITs –

TABLE - 2.3

Manpower in the Libraries

	IITKH	IITM	IITC	IITD	IITK	IITG	IITR
Professionals (Holding degree in Lib. & Information. Sc.)	23	22	20	22	20	11	24
Non – Professionals	30	47	32	33	35	10	22
Total	53	69	52	55	55	21	46

Table 2.3 Manpower in the Libraries : Here it is worth mention that the post of Librarian is lying vacant in IIT, Delhi and IIT, Guwahati. Recently Dr. J.C. Arora is appointed as Librarian of IIT, Bombay.

2.4 Organisation and Services of IIT Libraries :

The central library of IIT, Kharagpur is having Nine sections for proper distribution of work and to have an excellent management and control of different activities. The sections are : Book Acquisition; Periodical; Circulation; Non-book materials; Reference; Back Volumes; Binding; Xerox; and Automation. Including Librarian it has 23 staff members (i.e. having degree/s in Library & Information Science), 05 semi technical i.e. mechanics/ operators, 05 Ministerial (Clerks/ Typists) and 20 class IV staff (Peons/Library Attendants/Sweepers etc). The library is fully on computers. Out of these 25 staff members are actually working on computers. The services include on line Public Access Catalogue (OPAC), e-mail, searching electronic database on CD-ROM and Hard disk in electronic library. It offers list of current addition of books (monthly) and list of current additions of journals (monthly) to make users aware of the latest documents received in the library. It provides electronic SDI services to the faculty members monthly. The networking is done through Ernet, 144.16,.192,17 login search and the data of library is on Internet through Ernet. Barcoding of books has been completed for efficient circulation control. The future plans are to the upgrade the systems, have interface with Internet, to review total units of the library, organise Digital library and convert Institute's theses on CD-ROM. The execution of these plans depends on resources. The learning media centre requires 200 multimedia P.C.s with very good communication band and access to Internet.

The library of IIT, Mumbai has got 07 sections to have a systematic management of services and proper co-ordination in the various job routines of the library. Namely the sections are : Book Acquisition; Circulation; Technical processing; Journals; Binding; Reprography; Reference and Pamphlets (Standard specifications, Patents and Technical reports). The library has in all 23

professionals including librarian and 47 other staff members. The post of librarian was lying vacant for some years after the superanuation of Dr. S.R. Ganpule. Recently Dr. J.C. Arora, who was working in IIT, Delhi for several years as Dy. Librarian is appointed as Librarian. This huge library is located in an area of 6340 m^2 area. The library is fully computerised and has 01 system manager and 06 data entry operators. Besides this 40 members i.e .all professional and administrative staff of the library are trained to work on computers. The library is kept open on all days in a year except 03 National Holidays. On a normal working day it remains open from 8.00 to 23.00 hrs and on holidays from 10.00 to 17.00 hrs. The library has a seating management for 600 readers at a time. The annual budget is of 3 crores to built the collection of books journals CD-ROM databases and other reading materials. The expenditure on salaries building, furniture, maintenance etc. is included in central budget of the Institute. The library has CD-ROM Networking system with towers of 56 drives. The CD-ROM databases have been mounted on this system and can be accessed 24 hours on campus LAN. Some of the importance databases are – INSPEC on Disk, EI – Compendex – plus, CA Surveyor, CA 12th collective Index, Dissertation Abstracts on Disk, Index of Scientific and Technical Proceedings, Powder Diffraction files, Mc Graw-Hill concise Encyclopaedia of Technology, Oxford English Dictionary, Ullman's Encyclopaedia of Industrial Technology – Index etc. The library has Internet connection. A well designed Web Page the Windows to the resources of the central library is mounted on the library Web Server and can be accessed at Web site : http://www.library.iib.ernet.in. Library Web page provides an user friendly search facility to the database of books by keywords, author, title etc. and also links to other useful resources of the library. The computing facilities consist of Pentium servers, 22 terminals connected to the server in the library and Six CD-ROM Work stations of which four with Internet facility.

The library offers a wide range of services to support the Academic and Research activities of the Institute. Under Reference service the library has video viewing facilities, the students and staff can view here Educational films; information about the forthcoming National and International Conference; "Ref-Alert" informs about the latest reference books acquired by the library; Bibliographies and Documentation lists on special occasions; maintaining and making available data relating to the employment opportunities available. For scientists and engineers; maintains the data relating to courses, scholarships and fellowships available in the country and abroad; "MEHMAN" informs the books on weekly display; Display of articles and books published by the faculty of the Institute; "Lest You Miss" service keeps the users alert on the information appearing in the journals, newspapers, reports received in the library; and Current Awareness Service i.e. displaying the list of articles and news items of general interest on Science and Technology. The Reprography unit of the library has five photocopying machines, two of them are self-operated by the students and one for faculty. The photocopying facility is on payment basis to all registered users. Requests by post are also entertained. E-mail facility is available in all sections of the library. It is being used for sending claims of books and journals not received; queries regarding publishers price for journals and books etc.; queries related to availability of new books, journals, reports etc; Inter-Library loan; current information to faculty based on Current Contents on Disk (CCOD); to inform users about the documents needed by them urgently; renewal notices to faculty. The library has a plan to develop a computerised Network with all IITs and National as well as International organisation working in the disciplines of knowledge in which the Indian Institute of Technology is interested.

The central library of IIT, Chennai (Madras) was established in the year 1959. The library is providing excellent services to the users community under the able guidance and leadership of Dr. Harish Chandra, the Librarian. The number of

users is above 7.5 thousand and the library resources are being rigorously used by them. The circulation is above 1000 volumes per day. The library has a very rich collection having more than 300,000 volumes of monographs and about 900 titles of journals are received in hard copies. Other than hard copies the library has about 2000 documents in microforms, about 300 in audio-visual form and an ever increasing number of CD-ROMS. To handle this huge quantum of documents and to cater to the needs of large number of users of different categories the library has only 20 professions and 32 non-professional staff. Hence computerization is the only means of rescue. The library is using computers for its most of the house-keeping routines and services. There are 24 terminals available in the library. The library initially worked on ISQL program package based on UNIX operating system and using now ORACLE. For efficient circulation of documents Barcoding is being used. The library has Internet, CD-ROM and OPAC facilities for all categories of users. The library has already computerized its Book Acquisition system, circulation system cataloguing and serial control system. The Information storage and Retrieval services i.e. Current Awareness. Service, Selective Dissemination of Information and Retrospective Bibliographical Search have already been computerised. The total professionals out of Library Staff and some of non-professionals have been trained to work on computers and about 75% of them are actually using computers. The library staff has found the computer system excellent and very useful. The users are allowed to operate computers and they found the library services excellent.

The library of Indian Institute of Technology, Delhi was established in the year 1960. This library system supports the teaching, research and development programs of the Institute through one central library and 17 Departmental libraries. The central library is one of the most modern, three storeyed, centrally air conditioned academic libraries. All the students, faculty members and employees of the Institute are entitled to make use of its services and facilities. It also extends

its facilities to the industries under its corporate member program. It has above 7,000 registered members. Its collection has increased to more than 3,00,000 volumes comprising books, bound journals, standards, Technical Reports etc. Also CD-ROM databases and more than 1400 electronic journals have been made accessible at Institute's LAN. Library opens on Monday to Friday from 9.00 a.m. to 9.00 p.m. and on Saturday and Sundays and other holidays from 10.00 a.m. to 6.30 p.m. Only referral services and circulation of text books are undertaken on holidays. During examination days the library opens upto 12.00 midnight. Only on National Holidays the library remains closed.

On the ground floor collections of Text books, Book Bank, Ph.D. Theses, Books of Hindi, Humanities and Social Sciences, Standard Specifications and Technical Reports are housed. A General Reading Hall being operated separately on this floor. The same floor has computer Application Division, Web-based services, LIBSYS Server, CD-NET Server, CD-ROM Services, Acquisitions and Bindery sections. Registration of members for Library membership, issue of borrowers tickets, Bar coded users card, circulation services, Reader's services, Resources sharing services are provided on first floor of the library building. Video library, Reference and Conference documents, stock area of Science and Technology books, Library's main card catalogue and Web based OPAC are also available on this floor. Library's main card catalogue has on alphabetical part which includes Author, Title, Editor and subject entries, the other part is classified which is managed by UDC class member. The second floor has serial library (Periodical section); stock area of bound volumes of journals as well as display and stack of current journals, catalogue of journals, Kardex and xerox facilities.

The library offers a Book Bank facility to all eligible B. Tech. Students belonging to SC/ST, MCM Scholarship and Low-Income Group. The other categories of students are entitled to borrow not more than four books from the Book Bank on

10% charge basis. On the request of faculty and the students, the library arranges to procure the books and bound volumes of journals on Inter Library Loan (ILL) from the libraries in India. Similarly books and bound volumes of journals may be issued to any authorised library when request is made under I.L.L. Under IITs resource sharing agreement the library also supply photocopies of the requisite articles, technical reports, research papers etc. free of cost to its member libraries. The library is having a video library equipped with four VCPs and Video Display Units. It has a collection of more than one thousand video cassettes. The serial division of library receives more than 800 titles of current (in print form) on various disciplines. Information about their status of supply may be seen at Institute's Web-based on-line journals Kardex. In addition to this about 1400 titles of electronics journals can be accessed full-text through the main e-publisher's sites. There are more than 90,000 volumes of journals available in the library.

As is evident from the above description that the quantum of collection, users and services is big enough to be managed manually in an efficient manner and hence all the in house activities mainly Acquisition circulation, cataloguing, serial control etc. have been computerized implementing LIBSYS package. A web-based Digitized collection for distant and continuing education in Information Technology is being developed. This Demonstrative project, an Internet Information Technology. Institute's Web page is developed, maintained and implemented by the central library. The library has developed a number of databases in-house using Micro CDS/ISIS package for specialized collections available in the central library. These databases have recently been ported to Java ISIS interface so as to facilitate simultaneous access to the users on Internet and Intranet. The library also offers network-based CD-ROM search services which can be accessed anywhere on Campus LAN. For accessing CD-ROM databases available on campus LAN a user has to configure his/her Internet enabled PC as a client to the window NT server. This server hosts the CD networking software and

is hooked to CD-ROM Tower having multiple numbers of CD-ROM drives. For those library members who are not having their own computing facility, 15 pentium machines have also been installed in the computer application division of the library to facilitate CD-ROM search services from within the library. These working stations are also used for accessing Web-based electronic journals as well as other electronic resources available on Internet. LAN is fibre-optics based and functioning trouble free.

The central library of Indian Institute of Technology Kanpur is a huge, well-equipped and well organised library. Collection of about 400,000 volumes (including bound volumes of journals) in the field of Science and Technology, above 6,200 registered members and about 70 staff members are sufficient to reflect the size of this library. The other notable feature is that the library is fully computerised and may be called a digital library. The library subscribers to about 900 titles and receives regularly above 100 titles of the journals free of cost. I.e. as gratis, thus above 1000 titles of journals are being received. It also has collection of above 20,000 standards/patients, about 200 video cassettes and subscribe to 25 CD-ROMS on a regular basis. For smooth functioning of the library it is divided into Acquisition section, Technical Processing Section, Computer-aided Reference Section, Periodicals Section, Binding Section and an Academic Information section. The circulation counter remains open for 12 hours on each working day. The Librarian Dr. Bhooshan Lal is very dynamic, efficient and an excellent administrator. A library Automation system named it-KLAS has been designed and developed by a team of library and software professionals from the central library and the Deptt. of computer Science and Engineering 9 years back. This system is simple to operate and yet offers comprehensive functionality. The understanding of human and organisational realities has been a central factor in its conception and on going development. iit-KLAS is a fully integrated library automation package for computerising the various functions of library. It is a user

friendly solution offering complete functionality. The day to day tasks performed in the library are much easier to accomplish with iit-KLAS, thereby increasing the overall efficiency of the library. It offers simplicity of use with form-based, user friendly interfaces. It is entirely menu-driven with well planned and designed screens providing meaningful on-line messages. The package has extensive configurability and functionality. iit-KLAS permits the library to associate special authorisation levels to each user's responsibilities, individualised password on the login screen prevents unauthorised access.

The library has a full-fledged Library Automation Division which comprise of computer professionals and library science professionals who have been trained in the area of information systems. The on-line Academic Information Centre is fully integrated with all the other modules of iit-KLAS. AIC features user services such as on-line catalogue search, current contents search, information on new arrivals, details of journal-subscriptions and holdings, circulation queries, and Book-Indent queries. The library also offers Computer-Aided Reference Services (CARS) which provides over 20 different CD-ROM based databases such as Match Sci Disc, Compendex plus, Socio file, Psychlit and Comparch. The library provides current Awareness Services in the fields of Mathematics, Psychology, Sociology, Management, Mechanical Engineering, Chemical and Electronics Engineering. The library has recently prepared Window version of iit-KLAS and provided terminal to every member of library staff and 50 terminals for users.

Indian Institute of Technology, Guwahati was founded in 1994 and its central library was established in 1995. Dr. B. Saibaba is the I/C Librarian and has 25 professionals in the staff. As compared to the libraries of other IITs, the collection is small, say about 60,000 volumes only. About 700 titles of the current journals are being subscribed. It also has 500 micro-documents and about 5000 video-cassettes and CD-ROMs. The library offers it services to approx 1600 users. The

library has its own computer systems named ABM, HCL and Compaq, having 13 terminals. The library is fully computerised and 11 staff members are especially trained to work on computers. The users i.e. authorised members of the library are allowed to handle computers for on-line Public Access Catalogue and CD-ROM search. LIBSYS, a commercial program package is used in the library for its house-keeping jobs like Acquisition circulation, serial control and cataloguing. On-line search services, computerised current Awareness Service and Reference Services are also provided. Information Retrieval Services are connected by LAN throughout the campus. The staff and the readers have been reported to be fully satisfied by the services of the library. LIBSYS is found to be a very useful and efficient programme package. More and more users wish to-operate the computer system and so the library requires atleast 20 terminals more. Some more staff is also desired to introduce more facilities and services to the users.

University of Roorkee, founded in 1847 has remained on a very high position for studies and research in the disciplines of Science and Engineering for more than a century. It is one of the pioneering institutes of national importance. Considering its status and maintenance of high standards the Government of India had declared it as 7th Indian Institute of Technology in the year 2001. The library was established in 1848 and its collection is mainly on science and Technology. Besides the central library it has 16 Departmental libraries. For proper organisation and efficient management of services the central library is divided into 08 sections. The library staff consists of total 36 members including 1 librarian 3 Asstt. Librarians and 4 professional Asstts. It also has 12 Library Asstts, 4 Professionals and 12 library Attendants. Out of these 07 members have Master degree in Library and Information Science and 08 members have Bachelor degree in Library Science. The library has in its collection Text books, reference books the rare books theses and dissertations, journals and other types of special reading materials viz. Audio-visuals, Electronic documents, computer readable

materials compact Discs, Floppy Discs and CD-ROMS etc. The library subscribes to 352 titles of the journals. It has 2,65,421 books, about 2000 theses, 10,000 reference/bibliographic works and about 10,000 manuscripts, rare books etc.

The library of IIT, Roorkee, caters to the needs of about 300 teachers, 300 research scholars, 1350 post graduate students, 1600 under graduate students, 350 non-teaching staff and large number of special members. The library is heavily used i.e. on an average about 800 readers visit this library per day and about 250 volumes of books are issued per day. The collection grows very fast. In this behalf it is reported that approx. 3000 books and 400 bound volumes of the journals are added per year. This library, under the leadership of Sri Yogendra Singh, attempts to offer efficient library services by displaying New arrivals, Newspaper clippings, List of current journals and list of current contents. It also offers ready reference service. Selective Dissemination of Information Service. Reprographic services and Inter Library Loan services. The library is being opened on all days except the national holidays for more than 12 hours per day. The library is well funded because it receives 100% grant from Ministry of Human Resources Development of Government of India. The recurring budget of library for the year 2001-02 was Rs. 116 lacs excluding the salaries. Besides this the library received Rs.1 Crore as non-recurring during 9th five year plan. The library spent Rs. 75.05 lacs on subscription of current journals. However inspite of ever increasing budget the number of foreign journals had to be reduced from 448 titles in 1985 to 270 titles in 2001. The library is reported to be fully computerised and equipped with LAN. Intranet and Internet facilities. The library is also a member of UGC's INFLIBNET programme. It also has a link to DELNET. Out of 46 staff members working in the library 20 had been fully trained in computer applications and they are extending their services using computers. In the year 1994-95 UGC released Rs. 65 lacs as non-recurring grant and Rs. 1.72 lacs as recurring grant for 1998-99, Rs. 1.54 lacs for 1999-2000 and Rs. .1.72 lacs for the year 2001-2002. At present

mainly the data entry work is in progress and approx. 100,000 records are reported to be entered however this work is targeted to be completed by July 2003. The computer was installed in July'98 and is working satisfactorily on Windows NT 4.0 operating system and Troodon 2.0 software. The library is using computer for Acquisition, circulation, serial control, OPAC, Stock verification, on-line searching SDI services, Current Awareness Service and Bibliographic service. It is reported that Web page of library is under development. However, this library does not provide the services offered by INFLIBNET. Thus we find that this library, though belongs to the newly formed, IIT, Roorkee, is well organised and functioning efficiently.

SYSTEM DESIGN FOR AUTOMATION OF LIBRARIES

System can be defined as an assemblage or combination of things or parts forming a complex whole. It is something consisting of a set of first or infinite entities among which a set of relation is specified so that deductions are possible from some relations to the other or from the relations among the entities to the behaviour or history of the system. So system is an entity, conceptual or physical, which consists of inter-related, interacting or interdependent parts with common purpose or objectives. Library is a very good example of a system. It comprises of several subsystems which are linked together with the objectives of providing effective and efficient information service to its users. The basic subsystems of library are administration and planning, acquisition, serial control, technical processing, maintenance, conservation, reprography, publication, reference and documentation and circulation. Technical processing may contain next level of subsystems like cataloguing, classification, labeling etc. Thus any particular entity or process is a system in itself, it is subsystem in relation to its upper proximity and suprasystem for its subordinate systems in the hierarchical order of divisions.

System development is a structured process of analysing the ways in which things are done and designing and implementing new and better methods. Usually a computer based system is being created for improving the efficiency and effectiveness in a modern service library. The main phases of system development may fall into three groups. Groups one is system analysis which includes problem identification, feasibility study and detailed analysis phases. Group two is system

design and programming which include the system design and system building phases. Group three is system's implimentation.

In producing a system design the following consideration must be borne in mind –

    (i)   Features of a successful system.

    (ii)   Users' friendliness

    (iii)   Feasibility

    (iv)   Maintainability

    (v)   System security

The specific functions to be carried out during the system design process are : data definition, specifications of system logic, design of system modules, detailed definition of interfaces, design of input and output, specifications of control procedures, development of test requirements and preparation of correction plans. The steps of system design are as follows –

Step – 1 – Establish the need for automation

Step – 2 – Analyse the existing system – This step is concerned with analysis of system with a view to make them more effective either by modification or by substantial redesign. The activities under this step involves –

a) Gathering information on the existing system by observation, interviewing, questionnaires and document sampling.

b) Structuring of gathered information into input, processes, files and output.

c) Representation of information flow among these items using tools such as flow charts, data flow diagrams, and system outline charts.

d) Representation of processes involving multiple decisions using flow charts, structured English and decision tables.

Step –3 Define system requirements – Requirements may be stated as, general requirements, scope of operations, function at requirements, human factor requirements, volume to be handled and management data requirements.

Step – 4 -   System Design – This involves :

- Hardware specifications
- Software specifications
- Program design inputs like flow charts, data formats and file structures.
- Operational procedures
- Personnel and cost factors
- Design alternatives.

Step – 5 – Implementation – This includes system development, testing and modifications and installation.

Step – 6- Documentation, training and maintenance

However, under present circumstances the major criteria are considerations of Hardware software and humanware in system design and therefore this study concentration on these aspect to analyse the systems used in libraries.

3.1 – System Selection : General guidelines for selecting a system are –

a) Select products that have a fairly large user community for this will ensure good vendor supports.

b) Be careful about products offering unique features to ensure that these features do not isolate that product to a narrow portion of the market.

c) Be careful of a product that is too early or two late in the technology life – cycle.

d) The criteria for selecting or otherwise of a system should be decided by the customer/ user of the system.

e) Statements in the proposal must be taken as contractual.

f) Take money back guarantee from the supplier about the functioning of system as per the specifications.

g) Select out of those systems only which are installed and working on existing customers' sites.

Some specific steps involved in system selection may be summarised as follows –

a) Analysis of needs and current operations

b) Preparations of specifications.

c) Request for proposal should include description of application area, system

d) configuration, expected performance, evaluation criteria, cost limits and payment terms, site preparation requirements and training required etc.

e) Identification of probable suppliers and soliciting bids.

f) Evaluation of proposals and selection of supplier.

g) Negotiations with supplier and signing contract.

h) Site preparations.

i) Installation of system

j) System start up

k) Acceptance test

l) Final acceptance and autorisation of final payment.

3.1.1. Criteria for Hardware Selection :

A suitable computer hardware is very important for proper functioning of the system and sufficient care must be taken in its selection. Some important points are summarised below –

a) Computer configuration – This includes I/O devices, file structure and size, transactions, application characteristics and interfaces with other systems.

b) Word length and execution speed of CPU.

c) Memory capacity.

d) Disk Storage – Hard disk, floppy disk.

e) Tape storage

f) Terminals – Number, display colour, max. operational distance from main system.

g) Printers – Type, speed and width of page.

h) Operational System – No. of users, single / multi tasking etc.

i) Utilities – Sort / Merge, Text editing, File back up, Programme debugging etc.

j) File management.

k) Data base management system.

l) Programming languages.

m) Installation / Maintenance.

n) Documentation / Training.

3.1.2. Software Packages Selection – The criteria for selecting appropriate software are illustrated, very briefly, as follow –

a) Overall suitability – Meets the expressed specifications, configuration, cost, adaptability, bibliographic data handling and staff requirements.

b) Hardware considerations – compatibility main memory, processing speed, peripherals,

c) Software considerations – These include –

i) Operational System compatibility.

ii) Programming languages.

iii) Single / multi user.

iv) Portability.

v) Source code available.

vi) User friendliness.

vii) Compatibility with International Bibliographic standards.

viii) Response time.

ix) Handling of required character sets.

x) Connection to external systems for data exchange.

xi) Numerical data handling.

xii) Data base creation facilities

xiii) Modification facilities

xiv) File building facilities

xv) Indexing facilities

xvi) Thesaurus maintenance.

xvii) Authority files.

xviii) Single inverted file / separate files.

xix) Inversion of fields.

xx) Search features.

xxi) System output

xxii) Security

xxiii) Installation / maintenance.

3.2 System Design for Library Operations

The library operations include various housekeeping routines viz acquisition, circulation, serial control, cataloguing etc. and Information Storage and Retrieval system. System design for each of these operations is suggested below —

3.2.1. Automated Acquisition Control System :

An automated acquisition system is expected to perform certain managerial functions in addition to certain clerical functions, such as pre-order searching, creating purchase orders etc. An ideal system, which may be best suited for large library system like that of IITs may be designed to respond to regular order, blanket order, exchanges etc. It may also be designed to handle regular receipts, non-receipts, out-of-print documents with wrong billing, unwanted documents with right billing, and so on. The typical functions of this system are —

(i)   Pre – order searching to check duplicate orders.

(ii)   Creating purchase orders :

(iii)   Receiving materials :

    a) Request for invoice, if needed.

    b) Sending order letters (if necessary, alongwith cheques/draft).

(iv)   Claim (for damaged materials) and / or cancellation notices.

(v)   Providing information on orders outstanding and sometimes work-in-progress.

(vi)   Maintaining book fund accounts and printing book fund reports.

    a) Sending cheques / drafts (as and when necessary).

    b) Completion of accession list.

    c) Announcement of latest documents received.

    d) Completion of cataloguing.

Also whenever there is a delay in supply the system must prepare a reminder note and when books are received in must handle the various associated accounting procedures. In the system, given below, the bibliographical data in the order record can be amended to produce a catalogue card, update the accession list and produce automatically machine readable book card for computerised circulation system as part of the order system.

In addition to these, list of orders (by order number, by author, by title etc.) and various reports of statistical analysis may also be derived from the system. Besides these, provisions can also be made in the system to perform such functions as –

a) To hold orders until funds become available.

b) To re-order from a second vendor if the first fails to supply the documents; and

c) To compute vendor's performance measure e.g. Average supply time and average discount given etc.

Data Files :

The following factors are to be considered in advance while designing an automated acquisition system –

a) The files to be maintained .

b) Data elements in the records of each file.

c) Record format and media of the file.

d) Modes of operation (batch processing or on-line).

In a total on-line system, the acquisition librarian can access the files at any time from his/her desk itself. In a batch – processing system, the files are not directly

accessible but the printed lists are used. To perform the above mentioned functions in a typical system atleast the following files have to be maintained in a machine readable form –

1) Order file
2) Accession file
3) Fund file

But in order to have a smooth functioning of system it is being suggested to have the following files –

1) Purchase order file
2) Approval file
3) Author index file to purchase order file.
4) Control file.
5) Currency file.
6) Designation and Division file.
7) Find file.
8) Subject file.
9) Supplier file.
10) Text file.
11) Title index file to purchase order file.
12) Accession file.
13) Author index and title index files to accession file.

In a batch processing system the above files may be maintained on magnetic tapes and in an on-line system it is necessary to maintain them on disks. The purchase order file contains minimum information, required to process an order, related to document and the accession file contains complete information regarding the documents which are available in the library.

In order to have as many data elements as possible in order, a field cum variable field format similar to the MARC format, may be adopted. A record may consist of following three –

a) Leader
b) Directory
c) Variable data fields.

Leader – Each record may begin with a 24 character leader. It contains the structure of record and a few data elements. The data elements in the leader are required primarily to process the record. The data elements in the leader are shown in the following tables –

TABLE - 3.1

Data Elements in Leader for the Order Record

Character Position	Length	Name and Description
0-4	5	Record length (No. of characters in the order records.
5	1	Status code (0=New record; 1 = Replacement; 2 = Order cancelled; 3 = Deleted) After receiving document the record status may be changed to deleted.
6	1	Type of document (M = Monograph; S = Serial; R = Report; P = Patent; N = Non-book materials; 0 = Others etc.).
7	1	Mode of acquisition (P = Purchase ; S = subscription; E = Exchange etc).
8	1	Reminders (0 = Not sent ; 1 = sent).
9	1	Record Level code (0 Minimum information i.e. only ISBN;

		1 = Complete bibliographical information ; 2 = Partial information alongwith ISBN).
10	1	Length of the field indicators (No. associated with each variable field usually it is 2).
11	1	Sub field indicator length.
12-16	5	Base address of the data.
17-23	7	May be used to suit the local needs.

TABLE - 3.2

Data Elements in Leader for the Accession Record

Character Position	Length	Name and Description
0-4	5	Record lent.
5	1	Status code (0=New record; 1 = Record corrected; 2 = missing document; 3 = Weeded out.
6	1	Type of document (M = Monograph; S = Serial; R = Report; P = Patent; N = Non-book materials; O = Others etc.;
7	1	Mode of acquisition (P = Purchase ; S = subscription; E = Exchange; C = Complimentary copy).
8	1	Location of document (0 = In the main library; A – Z = code of branch libraries).
9	1	Blank character (for local use).
10	1	Length of the field indicator (Indicator associated with each variable usually it is 2).
11	1	Sub field indicator length.
12-16	5	Base address of the data.
17-23	7	May be used to suit the local needs.

Directory – It is an index to the location of the variable fields within a record. It is made up of a series of fixed length fields consisting of tags and the starting character position of the field. The directory begins immediately after the leader and end always with a field terminator. The number of entries in the directory depends on the number of variable data field in the record.

TABLE - 3.3

Data Elements in Directory for Order and Accession Records

Character Position	Length	Name and Description
0-2	3	Tag (A 3 character number that identifies a variable field).
3-6	4	Starting character position (A 4 character number which identifies the position of the field in record of the first character of a field relative to the base address of the data.

Note – In MARC format, it is also suggested to store the size of each field alongwith its tag and starting character position.

Variable Data fields –

The variable data fields consist of a series of variables (data elements). Each of these fields may begin with the field or subfield indicators. The various data elements for an order file/or and accession for an accession file are given in the following table –

TABLE - 3.4

Data Elements (Variables) for Order/Accession Record

SN	Tag	Field Indicator	Name and Description
1	001	@a	ISSN
		@b	ISBN
		@c	CODEN
		@d	LC Card number
		@e	Any other information
2	002	@a	Accession Number
			Title Associated with :
3	003	@a	Analytic (an article)
		@b	Monograph
		@c	Collection
			Persons Associated with (Author/Collaborator etc.) :
4	004	@a	Analytic
		@b	Monograph.
		@c	Collection.
			Affiliation
5	005	@a	Analytic
		@b	Monograph.
		@c	Collection
			Corporate body associated with
6	006	@a	Analytic
		@b	Monograph
		@c	Collection

7	007	@a	Edition
8	008	@a	Volume Number
9	009	@a	Part Number
10	010	@a	Issue Number
			Date
11	011	@a	Date of publication
		@b	Other than date of publication
			Language
12	012	@a	Of the text
		@b	Of the summaries
13	013	@a	Name of publisher
14	014	@a	Place of publication
			Collection
15	015	@a	Analytic
		@b	Monograph
		@c	Collection
			Additional data elements for description of conference documents
16	016	@a	Name of Meeting (i.e. Conference/Seminar/Congress etc).
17	017	@a	Location of the meeting.
18	018	@a	Date of meeting.
			Additional Data elements for description of patent documents
19	019	@a	Identification of patent document.
20	020	@a	Persons associated with patent.
21	021	@a	Corporate body associated with patent.
22	022	@a	Domestic filing data of document

23	023	@a	Convention priority data of patent.
24	024	@a	Reference to legally related domestic patent.
			Additional Data Elements for description of Reports.
25	025	@a	Report Number
26	026	@a	Name of the performing organisation.
27	027	@a	Contract / Grant number.
			Additional Data elements for description of Theses and Dissertations.
28	028	@a	University / Other educational institution
29	029	@a	Type of degree
			Note
30	030	@a	Summary only note]
		@b	Bibliography note.
		@c	Abstracts
		@d	Ancillary data.
			Subject Code
31	031	@a	Broad subject of ordering code
		@b	UDC Number
		@c	CC Number
		@d	Other classification number
		@e	Controlled index term
		@f	Uncontrolled index term.
32	032	@a	Name of the currency.
33	033	@a	Cost / Subscription
34	034	@a	Handling charges
35	035	@a	Exchange rate (For Rs. 100)
36	036	@a	Invoice number

37	037	@a	Invoice date.
38	038		Invoice Amount
39	039		Name of the bank.
40	040		Cheque / Draft number
41	041		Date of cheque / Draft
42	042		Binding Charges (in Rupees).
43	043		Vendors information
		@a	Vendor's Name
		@b	Person/ Corporate body with whom the document is exchanged.
		@c	Person/Corporate body who has gifted the document.
44	044	@I	Address (I = 0,1,2,………… 9)
45	045	@a	City
		@b	Pin Code
		@c	Country
			Dates Related to Order
46	046	@a	Record created / Purchase order sent.
47	047	@a	Date when the document is received.
48	048	@a	Date when the document is claimed for a defective copy.
49	049	@a	Date when the claimed copy is received.
50	050	@a	Date when the order is cancelled.
51	051	@a	Date of sending the last reminder
52	052	@a	Date of approval of the document
53	053	@a	Expected arrival date.
54	054	@a	Purchase order number
55	055	@a	Quantity ordered (No. of copies).

56	056	@a	Missing issue / document information
57	057	@a	Country of publication.
58	058	@a	Title of serial.
59	059	@a	Series designation

Note – Serial nos. 1($a-$e), 10, and 56 are relevant only to the acquisition of periodical / serial publications.

Fund File

The fund file may contain –

(i)   Total amount available for the year (Local and foreign currency).

(ii)   Amount to be spent for different types of documents (viz – Monographs, Journals, Magazines, Reports etc).

(iii)   Amount to be spent for different subjects (viz. – Physics, Chemistry, Mechanical Engineering, Civil Engineering etc.).

(iv)   Amount spent in the previous month of the current year as suggested in (ii) and (iii).

Steps involved in the Design and Development of Acquisition System – The following steps are involved :

Step A – First a worksheet has to be designed and the necessary information required for an order has to be written in the worksheet. A sample worksheet is given below –

TABLE - 3.5

Worksheet

044	Order date	054 Order Number
001	ISBN	
004	Author	
003	Title	
013	Name of the Publisher	Year
033	Price	
034	Vendor's Name and Address.	

Type of Document   S/M/P/R/N/O

Step B – Key in the data from the worksheet to the   In – Process file. This file contains the minimum required data elements to create an order file. Each record in the In-Process file consists of one data element and its tag. For example :

For Title –

003 $ a   Advanced cataloguing Practice.

For Author –

004 $a   Gautam, J.N. and Singh, Niranjan.

DIERICLEX (H) AND HOPKINSON (A), Comp. & ed. – Reference Manual for Machine Readable Bibliographic Description. Ed 2 – Paris, UNESCO, 1981.

The last character in each of the order must be a special character, so that one can easily identify the end of the data elements. If the tag is 000, it can be treated as the end of a bibliographical record if the tag is 999 it can be treated as the end of the file (in the In – process file).

Step C – Processing the In – process file to create an order file. For each block (consisting of information regarding order for a document) of information an order record has to be created, to be stored in the order file. As and when the order is created an order letter may be printed. After receiving the invoice, the order file may have to be processed again to print an order letter. This letter may be sent to the vendor alongwith the cheque/draft, if necessary.

Step D – Processing the order file

    (i)   Send reminders

    (ii)   Send claim notices for replacement of defective copies; and

    (iii)   Update the accession record in the accession file etc.

Step E – Preparation of –

    (i)   Catalogue cards ;

    (ii)   Book cards; and

    (iii)   Due date slips, etc.

Step F – Processing the order file and fund file (once in a quarter or 6-9 months, to obtain financial statements and also to evaluate vendor's performance etc.

3.2.2. Automated Serial Control System

Automation of serial control system helps to handle processing of serials more easily, quickly and economically. Automated serial control systems are usually designed and developed independently from book order system because of the very nature of serials. The serials are to be subscribed regularly as well their cataloguing data, holding in particular, undergoes changes very frequently. The simplest type of serial control system is the straight listing of information regarding each title. In such a system the information is key-punched and then the printed lists are obtained by title, subject or any other sequence. Multiple copies of the library holding can be produced easily and made available to users of library even at remote points. On a micro computer the arrival file and holding file may be maintained on floppy disks and appropriately used.

Functions of a Serial Control System

Before going into the details of the system it will be appropriate to look into its general objectives which are to handle serials and maintain holding list. To achieve these objectives the system must perform the following functions –

A) Inputting serial data.

B) Ordering new serials

C) Renewal of presently subscribed serials.

D) Cancellation of presently subscribed serials, if needed.

E) Accessioning of individual issues as and when received.

F) Sending reminders, if necessary.

G) Claiming the issues, if necessary (such as replacement copy for soiled or defective issues).

H) Selective follow up of missing issues.

I) Preparation of lists like –

    i)   List of serials received during a specified period.

    ii)   List of serials cancelled during a specified period.

    iii)   List of holdings with their status i.e. on shelf, on binding, on circulation etc.

J) Keeping tract of the amount spend on serials' subscription, serials' binding etc.

K) Estimate cost of budget for the next academic / and financial year.

L) Binding cost.

The number of above mentioned functions may differ on the basis of local needs.

Data Files

To perform the above mentioned functions it is advised to maintain the following files –

    i)   Periodical main file.

    ii)   Publisher/ Agent file.

    iii)   Country/Currency file

    iv)   Fund file

    v)   Payment file

    vi)   New arrival file

    vii)   Holding file.

The number of above files may differ depending upon the type of operating system, but atleast the following three files have to be maintained on disk –

    i)   Order file

    ii)   Holding file

    iii)   Fund file.

In order to have as many data elements as possible in the order and holding files the following format, very similar to that of MARC may be adopted :-

TABLE - 3.6

Data Elements in the Leader for Order file in Serial Control System

Character Position	Name of Description	Remarks
0-4	Record length	0 = New record; 1 = Request for replacement of a defective copy; 2 = order cancelled; 3 = Deleted.
6	Type of document	S = Serial; O = Others, etc.
7	Frequency of the serial	W = Weekly; F = Fortnightly; M = Monthly; 2 = Once in two months; Q = Quarterly; 4 = Once in 4 months; H = Half yearly; Y = Yearly; I = Irregular
8	Type of Journal	P = Primary; S = Secondary; T = Territory, M = Magazines etc.
9	Order for	0 = For new journal; 1 = For renewal 2 = For back volumes.
10	Records level	0 = Record contains the minimum information; 1 = Partial information; 2 = Complete information (0 level is effective only in an on-line system).
11	Length of the Field indicator	Either 0, 1, or 2.

12	Length of the subfield indicator	Either 0,1, or 2.
13	Reminder sent or not	0 = Sent; 1 = Not sent.
14-18	Base address of the data.	-
19-23	Used for local purposes	-

TABLE – 3.7

Data Elements in the Leader for Holding File

Character Position	Name and Description	Remarks
0-4	Record length	-
5-9	Accession Number	-
10	Mode of acquisition	-
11	Frequency of the journal	-
12	Type of journal	-
13	Foreign / Indian Publication	I = Indian; 0 = Foreign
14	Bound / Unbound volumes	B = Bound; U = Unbound
15	Complete / Incomplete	C = Complete; I = In complete
16	Location in the library	-
17-21	Base address for data	-
22-23	Used for local purposes	-

Steps in Design and Development of System

The following steps are involved in designing and developing the system for serial control –

Step 1 – A worksheet has to be designed in following manner –

TABLE - 3.8

Worksheet for Creating the In – Process File

Tag	Name and Description	Remarks
(058)	Title of the serial	
(013)	Name of the publisher	
(014)	Place of publication	
(043)	Name and address of Vendor / Donor / Exchange	
(011)	Year of publication	
(008)	Volume number	Part / Issue
	Order for New subscription/Renewal/Back Volumes. Mode of Acquisition	E/S
	Frequency of the journal	W/F/M/2/Q/4/H/Y/I
	Type of journal	P/S/T/M
(001)	ISSN	(046) Order date
(033)	Expected arrival date.	

Step 2 – Key in the data from worksheet to in – process file (a temporary file). The file contains order data. Each record in the In-process file consists of one data element and its tag. Further in the In-process file the records may be conveniently grouped and each group may be called as a block of information. A block may then be divided into two sub-blocks. The first sub-block for the minimum required

data elements and the second sub-block for the issue numbers and their expected dates of arrival.

Step 3 – An order file is created : This means processing the In – process file to prepare order records. For each record in the 2nd sub-block an order record is created alongwith the information available in the 1st Sub-block. That record is then written into the order file. If there are 12 issues for a given volume 12 order records are created one for each issue with its arrival date.

As and when the block of information in the In-process file is processed, an order letter (requesting for invoice) is printed. After receiving the invoice, the order file may be processed alongwith the financial information, to print an order letter. This letter may be sent to the vendor/publisher alongwith the cheque/Draft.

Step 4 – Processing the order file depending on the requirements for –
   a) Sending reminders
   b) Sending claim notices
   c) Preparing holding file, etc.

Step 5 – Processing the holding file to :
   a) get catalogue cards; book cards, due date slips etc.
   b) complete and update the holding record; and
   c) get the binding statements.

Step 6 – Processing fund file as well as order file to obtain financial statements :

When program has to be developed in-house/locally separate programs have to be written for each step 1 to 6.

3.2.3. *Automated Circulation Control System* –

Circulation, as a library function, is very specific, definable and similar to common business activities such as material handling and inventory control. Circulation control is mainly concerned with the functions of keeping track of documents taken out of the library by the users i.e. of charging, discharging, overdue control, reserves and associated file maintenance activities. It is, therefore, quite amenable for automation. Any circulation system must contain information on document, borrower and time of return.

Functions – Any circulation control system should be capable of performing the following functions –

- i)   Creation, updation and deletion of members.
- ii)   Keeping track of loan details.
- iii)   Validation of members, at the time of loans.
- iv)   Reservation of issued documents.
- v)   Renewal of loans.
- vi)   Calculation of fines.
- vii)   Generation of reminder notices.
- viii) Generation of statistical reports.
- ix)   Provision of reporting the location of a document and/or number of documents borrowed by a member.

To perform the above functions in addition to charging and discharging, circulation systems are designed to record and manipulate the following three kinds of information :

A) Information about the borrower (Name, address, telephone number, Identification number, category etc).

B) Information about the document (call. no., Identification no., normally bar code, author, title, date of publication etc).

C) Information about the transaction (such as due date or date of loan, in some cases the time of loan).

System Design and Development

This involves identification of various files, sequence of operation on them i.e. modules, reports alongwith their periodicity, software and hardware requirements.

Data Files – For an on-line automated circulation control system the desired files and their data elements may be as follows –

TABLE - 3.91

Description of files of circulation control with data elements

SN	Name of File	Data Elements
1	User File	a) User identification Number b) Name and address c) Telephone number, if any. d) Category, (Student / Faculty / Staff etc). e) Subject interest f) Delinquency (O may be used for this).
2	Document file	a) Document Identification Number b) Call Number

		c) Accession Number
		d) Author (Person or corporate body).
		e) Title.
		f) Year of publication.
		g) Volume no., part no. and edition, if any.
		h) Publisher
		i) Place of publication.
		j) Report / Patent / Standard nos. etc., if any.
3.	Transaction File (Absence)	a) User Identification Number
		b) Document Identification Number (Call no. or Accession no.)
		c) Author
		d) Title
		e) Year of Publication
		f) Date of transaction or Due date
		g) Kind of transaction (Charging, discharging etc).
		h) Location of the transaction (Main Library/branch library etc.).
4.	Transaction File (Inventory)	a) User Identification Number
		b) Document Identification Number
		c) Date of transaction or Due date
		d) Kind of transaction.
		e) Location of the transaction.
5.	Request file	a) User Identification Number
		b) Document Identification Number
		c) Data when the book is reserved.

Methods of Inputting Identification Numbers

The simplicity of an automated circulation system depends upon how best the document and identification numbers are recorded at the circulation desk at the time of charging/discharging a document. The identification numbers can be assigned as follows-

Document Identification Number – The minimum required data identifying a document are :

Document Identification Number	(12 Characters)
Author	(15 Characters)
Edition number, if any	(2 Characters)
Volume number, if any	(2 Characters)
Year of publication	(4 Characters)
Name of publisher	(10 Characters)
Place of Publisher	(10 Characters)

The basic problem is with document identification number. It can be any of the following–
   a) Call Number
   b) Accession Number
   c) ISBN
   d) Any other Serial Number than Accession Number.
   e) Any other code.

In most of the system studied bar-coded labels are used for identification of documents.

User Identification Number – This can be any of the following –

a) Roll Number or Register Number assigned by the library or parent body.

b) Social Security or Insurance Number.

c) Name.

In case of Academic libraries like IITs Register Number is considered to be best suited for UIN.

Modules – In order to perform the functions of an automated circulation control system it must have the following modules –

a) Member Create

b) Member Update

c) Issue

d) Return

e) Renewal

f) Reservation

g) Reminder

h) Query

i) Official job execution

j) Alert

k) Statistics.

Software :

The libraries may go for a readily available program – package or may develop its own program. COBOL, BASIC, PASCAL or PROLOG. Language or dBase III package can be used to develop the software package. Since dBase III provide easy modification of records, sorting / Indexing, generating reports and screen design it may be suggested to develop the software programs using dBase III

package. PRO LOG being the first practical logic programming language is considered to be most suited to develop a program.

PROLOG – Programs in PROLOG are treated as data in a database. One of the unique properties of PROLOG programs is their conciseness. It is common for a conventional program to require five to ten times more source code than the corresponding PROLOG.

The features of PROLOG are –

1. Both programs and data are represented through clauses.
2. General pattern matching is available through unification.
3. An automated influence mechanism with back tracking is provided.
4. A non-deterministic style of programming is possible.
5. Use of recursive programs and structures can provide simplicity.
6. Many PROLOG programs are invertible.
7. Both declarative and procedural semantics.
8. The ability to intersperse metalevel code with object level code.
9. PROLOG can deal with large database.
10. PROLOG allows straight forward knowledge modifications by producing more modular systems.

A few of the important practical advantages of using PROLOG are –

(i) The declarative nature of PROLOG programs and their conciseness, result is less time required for software development and improved productivity.

(ii) The declarative style of programming language is very natural, making the task of programming easier.

(iii) Because programming in PROLOG is closer to writing a specification, it is easier to address the issues of correctness and verifications in PROLOG than in any conventional language. In addition, task of debugging is easier.

(iv) PROLOG based systems can include features such as natural language interface and graphics.

3.2.4. Autoamted Cataloguing System

Due to lack of telecommunication facilities on an economical basis and non-availability of national bibliographies in a machine readable form in our country, the libraries in India have developed their own automated cataloguing system instead of developing such a system on a national level. Such a system can easily be developed as a by-product of a book-ordering system. The main activities of a cataloging system is the production of catalogue cards. In a computerised cataloguing system we can also produce, as a by-product of it, spine label, pockets and book cards for use in circulation system. Also it provides most economically cataloguing information to the branch libraries.

Procedures involved in cataloguing are :

a) Preparing worksheet.

b) Generating machine readable records consisting of appropriate tags, these records can directly be stored on tapes or disk through terminals.

JOSE (Antony) – "Developing an automated circulation control system using Micro Prolog". IASLIC Bulletin, 39 (4), 1994. P. 161-4.

c) Verification of the machine readable catalogue records and finally generation of computer readable catalogue. It is usually on tape and key to the record is preferably through the call number.

d) Generation of added entries (such as author entry, title entry, series entry etc). These entries can be stored in an "Inverted file". In this file, the records consists of data elements and the link to the main record in the CORC; the data element may be either author or title or any other item which is in the main entry.

e) Generation of indexes and cross-reference entries. Records of the index files can be merged appropriately into the inverted file and the records of cross reference files can also be merged appropriately in the CORC (Computer Readable catalogue). To generate indexes and cross reference entries it is essential to maintain a subject authority file.

f) Printing the records in card form, book form or in machine readable form.

System Design and Development

To keep pace with the international standards as well to have links to national and international networks a system design on MARC pattern is suggested. The basic machine readable catalogue record consists of the leader, the Record Directory, the control fields and the variable fields.

The control field consists of both variable control number and variable fixed fields. The leader is fixed in length for all records contains 24 characters. It is a set of fields describing the general structure of the individual entry. The Record Directory is an index to the location of the control and variable fields in the record.

It consists of a series of fixed length entries, one for each variable field in the record. An entry in the Record Directory contains the identification tag, the length and starting character position in the record of each of the variable fields. The Record Directory will end with a field – terminator code. Since the number of variable fields in a record can vary, the total length of the Record Directory is also variable. Variable fields are made up of variable length alphanumeric data. All fields end with a field terminator code except the last variable field in a logical record which replaces the field terminator with an end of record code. Each variable field is identified by a three character numeric tag in the Record Directory. Tags may be repeated, as required, in a logical record. However, tags associated with the control fields will not be repeated in a logical record.

A detailed outline of data elements of Leader, Record Directory, Control fields and variable fields is as follows –

TABLE - 3.92

Data Elements in Leader of Automated Cataloguing

Element No.	Name of the Data Element	No. of Characters	Remarks
1	Logical Record Length (0-4)	5	The total no. of characters in the logical record including itself. The no. is right justified with leading zeros.
2.	Record Status (5)	1	n=New record; c = corrected/revised record; d=deleted records
3.	Type of Record (6)	1	a= Language material printed etc.;

4.	Bibliographic level (7)	1	m = monograph; a = Analytical; and c = Collections etc.
5.	Blank Characters (8-9)	2	For local purposes.
6.	Indicator Count (10)	1	Each variable field begins with two characters called indicator which provide certain descriptive information about the data which follows. For monographs all variable fields must be incriminated by 2 to reach the subfield code for the first data element in the field.
7.	Subfield code count (11)	1	Each data element with a variable field is identified by a two character subfield code made up of a delimiter and a lower case alphabetic character.
8.	Base address of data (12-16)	5	A number which is the starting character position of the first control field i.e. equal to the length of Leader and the Record directory. The starting character position for each field entered in the record is relative to the first character of the first control field.
9.	Blank Characters (17-23)	7	For local use.

TABLE - 3.93

Data Elements in the Record Directory

Element No.	Name of the Data Element	Number of Characters	Character position in the Directory
1	Tag	3	0-2
2	Field length	4	3-6
3	Starting Character Position	5	7-11

TABLE - 3.94

Control Field Description

Tag	Name	Data Elements	No. of Characters	Character position in the field
001	Card Number (Control No.)	1. Alphabetic prefix	3	0-2
		2. Year	4	3-6
		3. Number	6	7-12
		4. Supplement	1	13
		5. Suffix	Variable	14
008	Fixed length data elements	1. Data entered on file	6	0-5
		2. Type of publication data code	1	6
			4	7-10
		3. Date 1	4	11-14
		4. Date 2	3	15-17
		5. Country of publication code	4	18-21
			1	22

		6. Illustration code	1	23
		7. Intellectual level code	4	24-27
		8. Form of reproduction code	1	28
			1	29
		9. Form of content codes	1	30
		10. Govt. publication indicator	1	31
			1	32
		11. Conference/meeting indicator		
			1	33
		12. Festschrift indicator	1	34
		13. Index indicator	3	35-37
		14. Main entry in body of entry indicator	1	38
			1	39
		15. Fiction indicator		
		16. Biography code		
		17. Language code		
		18. Modified record indicator		
		19. Cataloguing service code.		

TABLE - 3.95

Variable Field Tags

Tag		Data
	Control Number	
010		Card Number
011		Linking Card Number.
015		National bibliography number
016		Linking NBN.
020		Stand Book Number
025		Overseas Acquisition Number
026		Linking OAN
035		Local System Number (LSN)
036		Linking LSN
040		Cataloging service.
041		Language
042		Search Code
	Knowledge Number	
050		Call Number
051		Copy Statement
	Main Entry	
100		Personal name
110		Corporate name
111		Conference / Meeting
130		Uniform title handling
	Supplied Titles	

240		Uniform title
241		Romanized title
242		Translated title
	Title Paragraph	
245		Title
250		Edition Statement
260		Imprint
	Collation	
300		Collation
350		Bibliographic Price
360		Converted Price
	Series notes	
400		Personal Name – Title (Traced Name)
410		Corporate Name – Title (Traced Name)
440		Title (Traced Name)
490		Series untraced or traced differently
	Bibliographical Notes	
500		General Notes
501		"Bound with" Notes
502		Dissertation Notes
503		Bibliographical history Notes
504		Bibliography Note
505		"Limited Use" Note
506		Abstract or Annotation
	Subject Added Entries	
600		Personal Name
610		Corporate Name (Excluding political jurisdiction alone)

611		Conference / meeting
630		Uniform title heading
	LC Subject Headings	
650		Topical
651		Geographic Name
652		Political jurisdiction alone or with subject subdivisions.
	Other Subject Headings	
690		Local Subject Heading System.
	Other Added Entries	
700		Personal Name
710		Corporate Name
711		Conference / Meeting
730		Uniform Title heading
740		Title traced differently
750		Name not capable of authorship.
	Series Added Entries	
800		Personal Name – Title
810		Corporate Name – Title
811		Conference / Meeting Title
840		Title

3.2.5. Automated Information Retrieval System

A typical Information Retrieval System consists of –

a) Database Maintenance :

Creation of the database

Updating (deleting/inserting/modifying the record).

b) Query Analysis :

Receiving the queries.

Analysing and structuring the queries appropriately.

Matching the queries with the entries in the database.

c) Information Dissemination Output :

Provide the retrieved information to the users.

d) Evaluation of Information Retrieval System.

In Library and Information field our concern mostly is with bibliographical database and their operations. Hence our IRS may safely be called Bibliographical Information Retrieval System (BIRS). A BIRS is defined a set of rules and procedures operated by human beings and/or computers for performing some or all of the following operations :

i) Classification and / or Indexing – Constructing representations of documents eg. Preparing main entries, cross – reference entries, added entries including subject index and then arranging the entries in a helpful sequence.

ii) Search formulation (of users' query).

iii) Searching (Matching documents against users' query).

iv) Retrieving (Printing)

v) Feedback (Modifying any or all of the above steps on the basis of evaluation by users).

vi) Indexing language construction.

Design and Development of BIRS

The major steps involved in design and development of a database for BIRS are –

a) Filling up of worksheets in a standardised manner (for worksheets design INIS, or AGRIS formats and for tags and sub-field indicators MARC may be adopted). Vocabulary control devices have also to be maintained for assigning descriptions to documents.

b) Transfer the information. A good input design has to be prepared at this stage.

c) Creating machine readable records.

The software to be developed consists of programs for the following purposes –

A) To create a database :

Input – Bibliographical information along with appropriate tags and subfield codes on tape or on disk.

Output – Machine – readable database including the inverted files.

B) To update the Database :

Input – Bibliographical database to be updated (same a in A)

Output – Updated Database (updating may involve inserting a record/deleting a record/correcting or modifying a record.

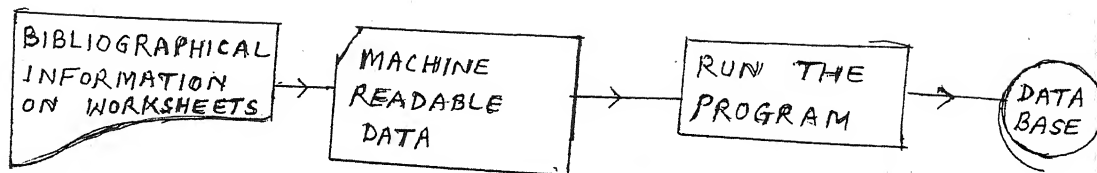Flow chart for updating the Database Encl. – 2

C) To Search the Database :
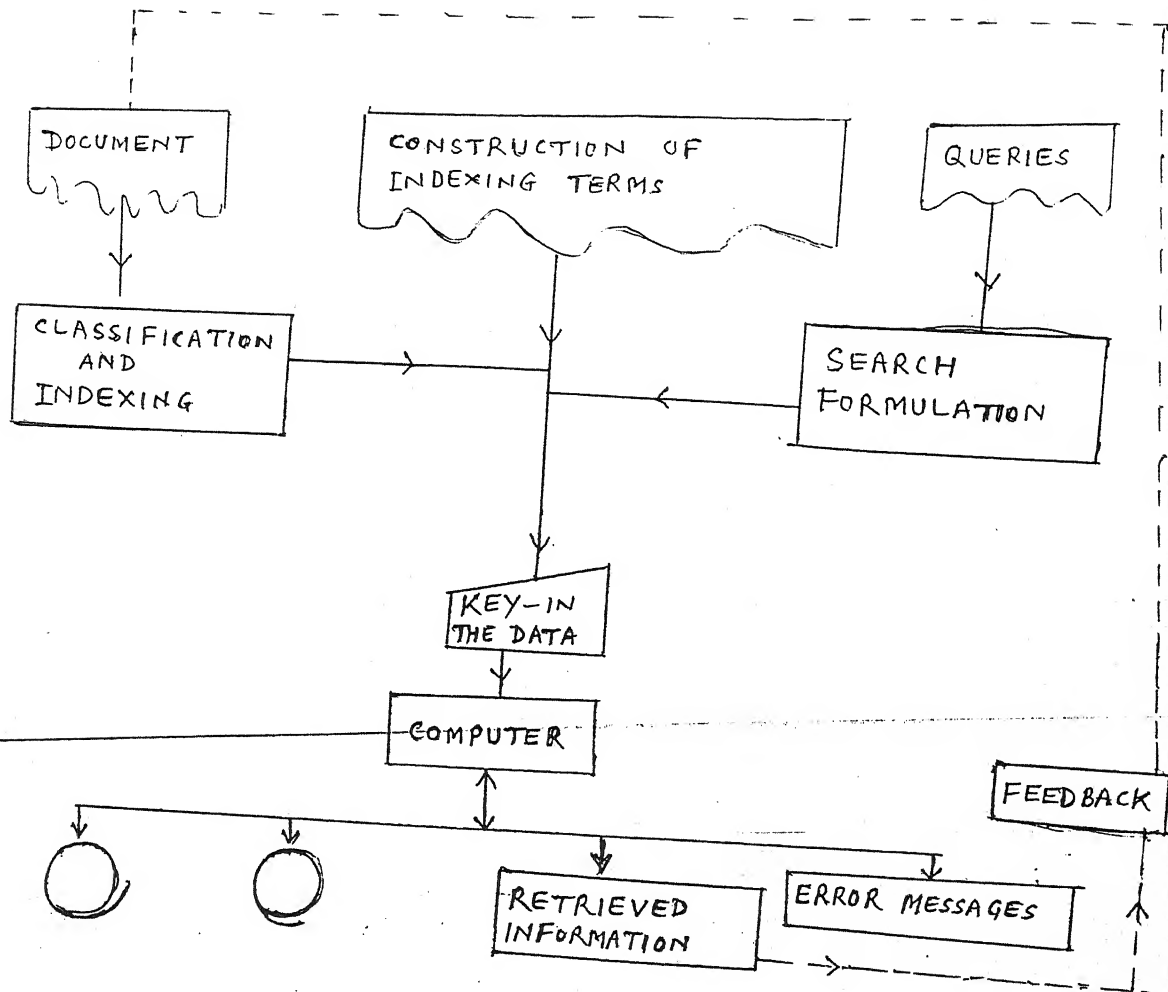
Integrated View of BIRS

Flowchart - 1

Flowchart for Creating a Database
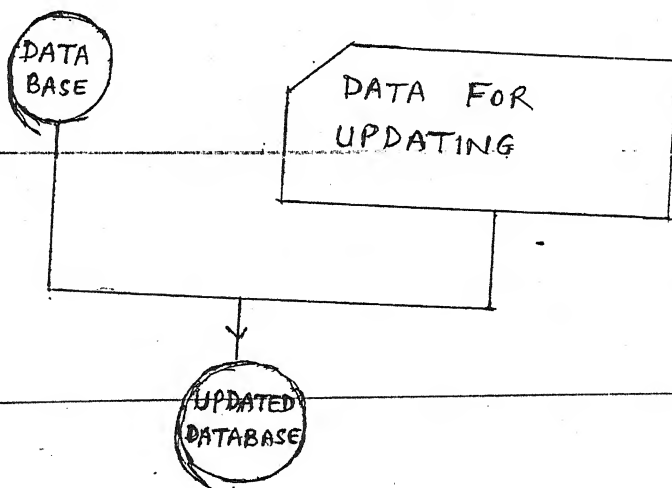
2. Flowchart for Updating the Database
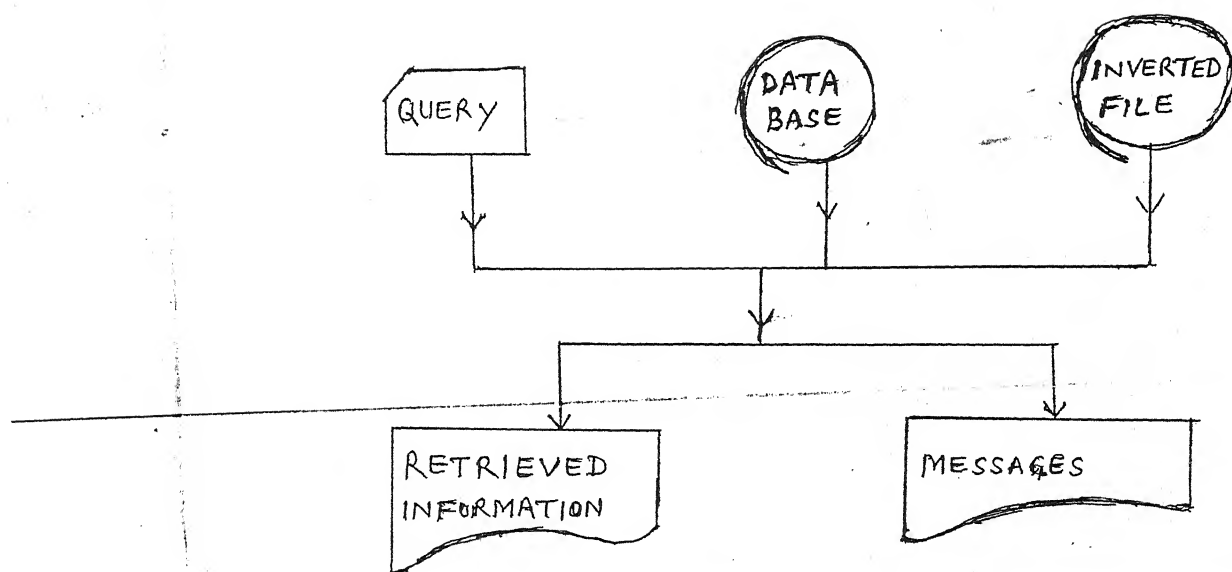
3. Flowchart for Searching the Database

Input – Query through terminals. A query may consist of either a single data elements or a combination of data elements.

Output – Retrieved information as print-outs or display on terminals.

Modes of Operations in BIRS / Flowchart for Searching the Database

The BIRS may be operated entirely either on batch mode or on-line mode or on a combination of both. Choosing a batch or on-line system is an important decision in design. In a batch system queries are grouped together and entered and are processed sequentially. In an on-line system each entry is entered from a terminal and is processed individually.

The advantage of using a system that is partly on-line and partly batch is that queries may be validated by the computer and any error corrected immediately by the operator, there are fewer possibilities of error when the data is entered at the terminals. Depending upon the availability of hardware, a typical BIRS can adopt different modes of operations. Which are as follows –

SN	Function	System
1.	Data entry	On-line
2.	Data update	Batch
3.	Retrospective Searching	Batch
4.	Large scale printing in retrospective searching	Batch
5.	Current awareness searching	On-line
6.	Index production	Batch

Data Entry – The data entry is an important component involved in design and development of BIRS. The purpose of data entry may be to :

a) Create a new database.
b) Insert a record in the existing database.
c) Delete a record in the existing database.
d) Modify the existing record in a database.

In order, to have an effective system for data entry a good worksheet for in putting the data designed. The software may be designed in such a way that the worksheet may be displayed on the screen. This makes keying in of data much simple. In CDS/ISIS while defining the database the user defines the worksheets which are displayed as and when the data are entered. In entering the data related to subject heading, often called descriptors, we may use a standard list of terms. This may be a simple list of terms used in a particular subject or it may be based on a scheme of classification or a thesaurus. A vocabulary control device most commonly used is thesaurus. It is a structured controlled vocabulary which links one term to its associated terms:

a) Broader term (Less specific in the subject).
b) Narrower term (More specific in the subject).
c) Related term at a similar level in subject mostly with a common broader term.
d) Homonymous Term (Same term used to describe different subjects).
e) Synonymous Term (Different terms used to describe a single subject or concept).

Out of the above the BT, NT and RT are most commonly used.
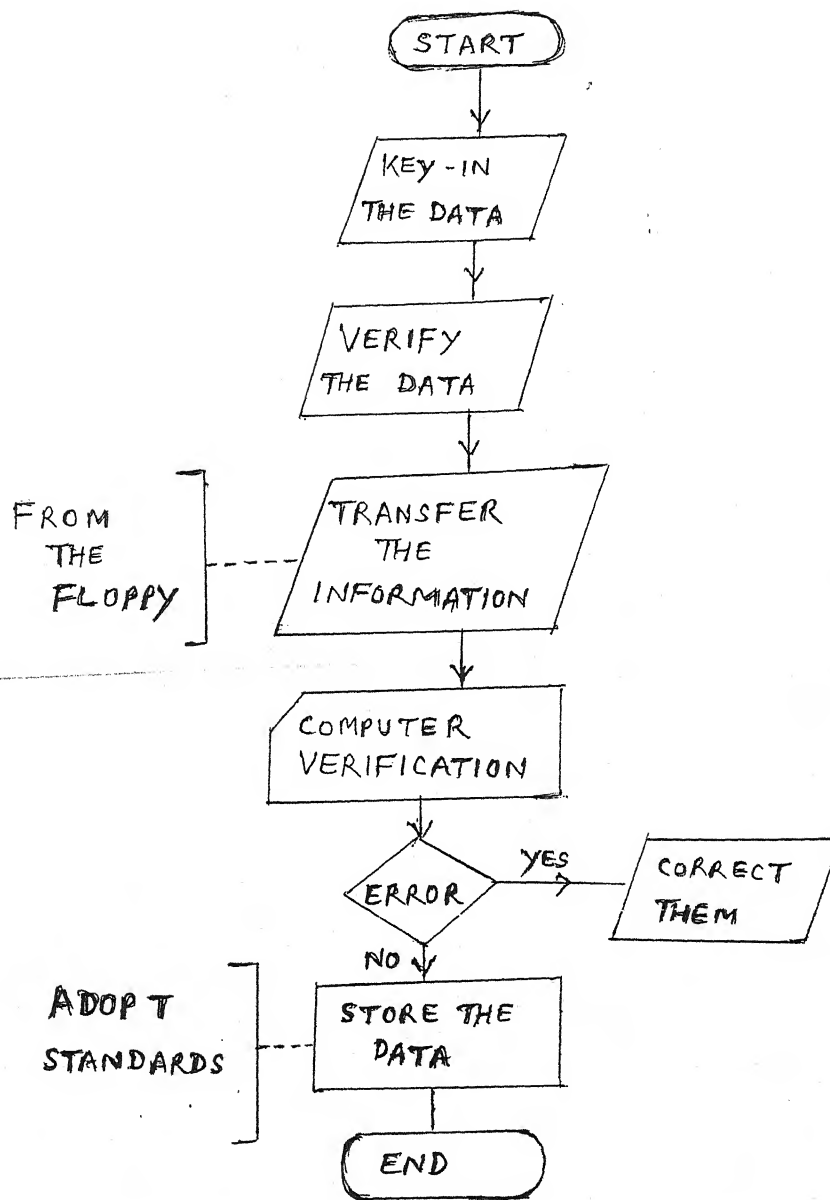
4. Flowchart of Data Entry in Batch Mode
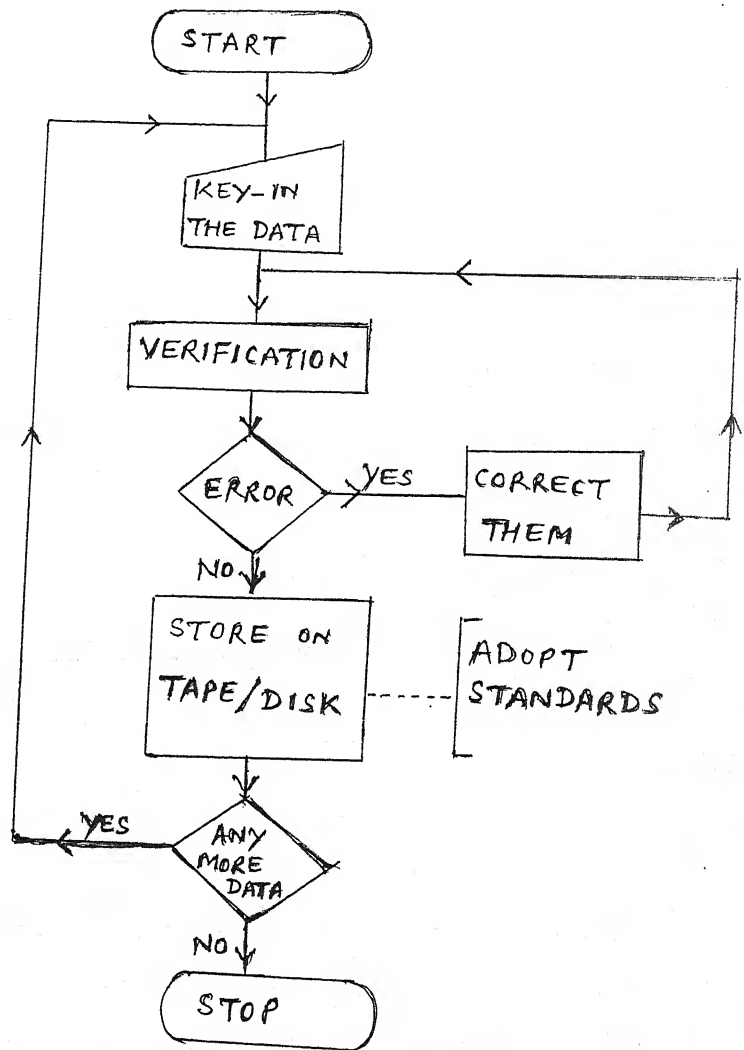
5. Flowchart of Data entry in On-line mode

Query Analysis and Searching

A query to a BIRS is a sequence of search statements. In batch system the query may consist of only a single statement. In interactive systems a query can consist of a sequence of statements. Most often, a query will be an expression consisting of data elements, attributes that specify the fields within which the terms are to be searched 95 Boolean operators.

A description of a query in a suitable form for input to a search program is called User's Interest Profile. The rules for formulation of interest profiles should be simple to be easily understood by the user, but they should also allow a proper representation of his/her search requirements.

Once a query is structured, the next process is 'matching'. It may be for the purpose of 'Retrospective searching' or for current Awareness Searching' or for 'Selective Dissemination of Information" (SDI). The users interest profile is matched against the secondary information database/bibliographical database. If the user wishes to have a 'retrospective search' the query has to be matched with all the secondary information, and for 'current awareness search the query has to be matched with recently (since the last current awareness search was made) acquired documents only.

The steps involved in search process may be shown by the following flow charts – Information Dissemination (Output)

The output from an BIRS serves a number of purposes :

a) Informing users about recent information / documents of a potential interest to them (SDI Service).

Start

Get the Query
from the Users

Analyse it
Formulate the
Search Expression

— Using the Boolean Operations.

Use Vocabulary control device
to standardise the descriptors

Search the inverted files to
get the relevant source
link and then search the
source file.

NO — Search — yes

Display
Message

Print the
relevant
record

Yes — Any
more

NO

stop
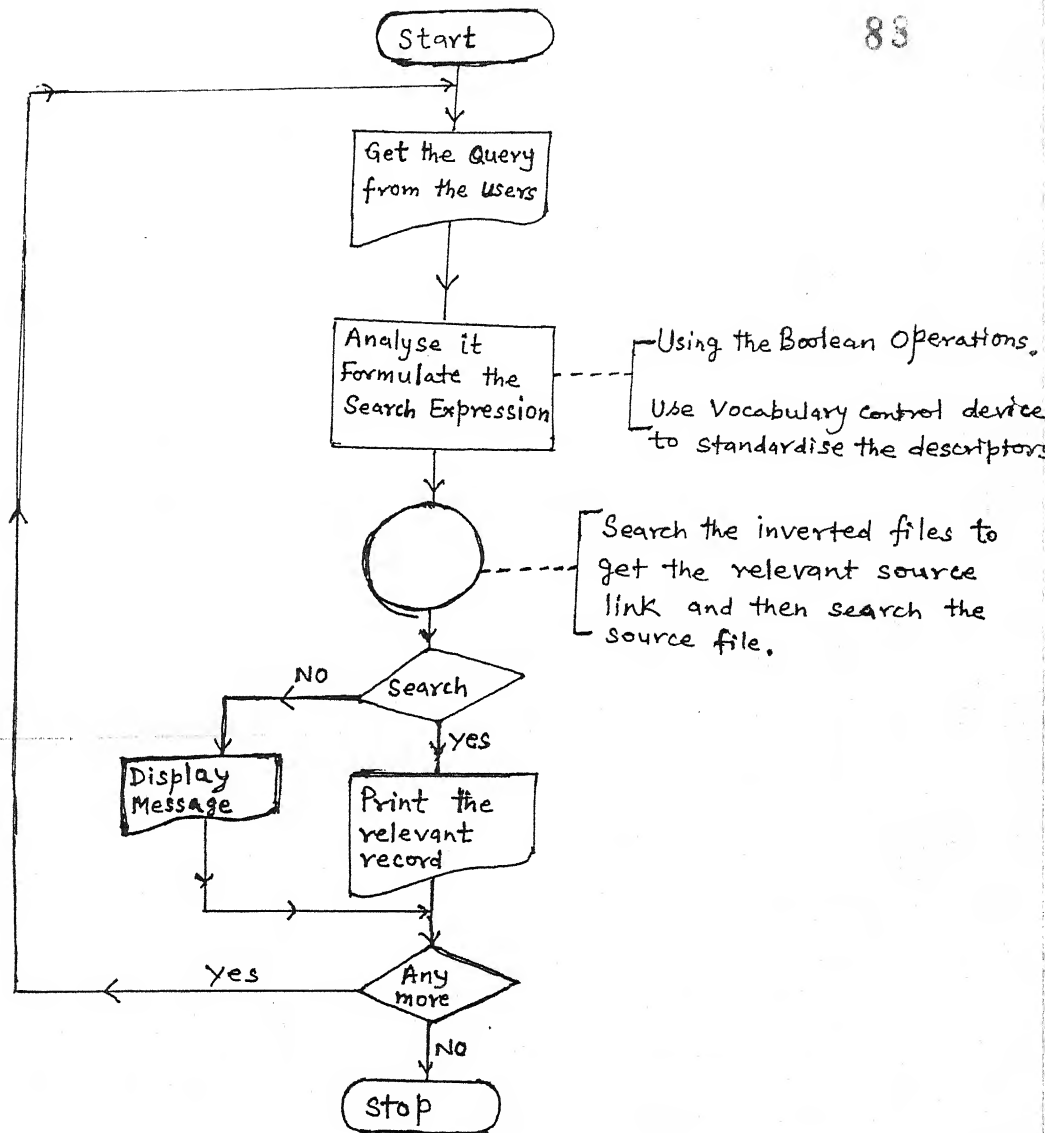
6. Flowchart of Searching in a Batch mode

The flowchart contains the following elements:

Start

Key-in Search terms

Search the inverted file to get the relevant search link and then search the source file.

Use the Vocabulary control, if necessary.

Thesaurus may be in computer-readable form.

success? — yes → **Relevant** — yes →

success? — No → Modify the Query (Yes)

Relevant — No → **Modify the Query?**

Modify the Query? — Yes → Modify the Query

Modify the Query? — No → Display the message

Modify the Query

Display the message

Relevant — yes → **Print the relevant information**

Any more — Yes → (loop back)

Any more — No → (end)

7. Flowchart of Searching in an On-line mode

b) Providing a list of all recent additions to all the users irrespective of whether or not the user is interested in the documents listed (CAS).

c) Maintaining one or more separate catalogue/s.

d) Generating and maintaining various indexes (Author, Titles Subject etc.) to the library collection.

e) Producing bibliographical publications for local use.

f) Producing bibliographies (on demand) on various subjects depending on special projects.

The output media may be –

i) Computer terminal output.

ii) Computer printed listings.

iii) Library catalogue cards.

iv) Microforms (Microfilm, Microfiche etc).

The process of producing various outputs of a search consists of several tasks such as –

a) Creation of entries necessary for each selected record.

b) Organizing the entries in a specified order.

c) Performing detailed formatting such as pagination, emboldening, keywords, handling over flow from one index card to another etc.

d) Formatting the printed list, the screen etc.

3.2.6. Design of Key – Word Indexing using CDS/ISIS

CDS/ISIS offers total flexibility in handling bibliographical information. The features to be highlighted are :-

VARIABLE FIELD :- This feature help in handling lengthy fields like title, conference name, series, etc. where these length can not be well predicted.

REPEATABLE FIELD : This is most useful feature for handling bibliographical information. Fields like author, report number, subject descriptor keyword, and series, which can have different value for a single record can be handled with ease. Multiple value of a field are delimited with a '%' sign, during data entry. The contents of these repeatable fields if selected for indexing, are given individual access points in the index. For Information Retrieval, ISIS offers features like the formation of a set, of the posting of an index term, and allows to define a boolean relation between the different sets in the form of search query. But for printing indexes for publications, like reading lists, literature surveys, current additions list and printed catalogues, one has to depends upon the uniterm index which it produces. This leads to the loss of context in which a keyword has been used, in relation to other keywords. Generic terms like design research, analysis, fabrication etc. do not mean anything unless one examine the main entry. This leads to the prohibitive use of such terms, thus sacrificing a lot of qualitative value of the index.

A utility program has been developed to generate a permuted keyword index. Pascal language is used. It can be used to generate permuted index for repeatable fields like keywords, authors and report numbers.

PROBLEM DEFINITION :- CDS/ISIS offers 'Uniterm Index' only through its standard system worksheet by choosing the '*' format. The index does not preserve the context in which a particular term is used. For example, if there are three subject terms say A,B and C used as descriptors for one document, the index, no doubt compact, resembles the following :

A	1
B	1
C	1

As a alternative, one can print the lead term and beneath that the full string as a KWAC index entry. This can be done by giving the tag for the keywords, without repeatability along with the 'm f n', instead of the '*' format while sorting on the keywords alone. Each index entry in two lined and the lead term is repeated in the next line. For example, the index will resemble the following :-

A

A,	B,	C	1
B			
A,	B,	C	1
C			
A,	B,	C	1

OBJECTIVE :- The objective of this utility program is to format all the keyword terms in one line string along with the reference to the main entry. Then the keyword terms in the string have to be permuted in a cyclic order in one direction to provide on access from each one of the term. Finally, all these strings have to be sorted alphabetically in the form of an index.

The gives rise to one line index entries while avoiding repetition and ensuring a saving of space. The entries will resemble the following :-

A,	B,	C	1
B,	C,	A	1
C,	A,	B	1

As main entry will have different number of index term (i.e. one record may have two keywords, while another may have 5 keywords), the program should be able to handle different cases.

SYSTEM DESIGN AND METHODOLOGY :- When one is producing a list of bibliographical records, the main entries are generally sorted on call number, broad subject heading or category no., or by author, title etc. As the records are to be sorted on any one of the above mentioned fields, it is advisable to transfer them into a 'TEMP' database, having the same structure of the regular database. This will help, to give a running serial number to the main part, starting from 001.

The different steps involved in producing the 'Permuted Index' are as follows :-

STEP 1 – CREAT 'TEMP' DATABASE :- From the regular database, creat the 'TEMP' data base by doing the following :-

- Copy the following files using DOS copy command

XXXXXX. FDT	to	TEMP.FDT
XXXXXX. FST	to	TEMP.FST
?XXXXX. FMT	to	?TEMP.FMT

(Required format for the main part)

XXXXXX. PFT   to   TEMP.PFT

- Re-initiatialise the 'TEMP' database.
- Edit the TEMP.FDT using the 'N' option. (No document Mode) using Wordstar.
- Change the information to 'TEMP' in the first three lines for default values

W   :   TEMP

F   :   TEMP

S   :   TEMP

These are the default names of the worksheet, print format, and field selection table for database 'TEMP'. Save the file. This will ensure that the 'TEMP' database has the same structure of the regular database in use.

STEP-2 CREAT 'SORT' DATABASE :- Creat another database with the name of 'SORT', having one field with Tag = 10. Name of the field = Keyword string, Length = 500, Type of character = X;

STEP 3 – CREAT A HIT FILE :- Creat a 'Hit file' by sorting on the desired field from the regular database. Make a search for the required records on the regular database and save the search. Go to 'Print Worksheet'. Use the file name, else use the range of MFN. You may choose the default format, however we do not have an intention to print the record. Choose 'Y' option for sorting and enter 'NULL' as the print file name. In the 'Sort Worksheet', sort on the field, according to which the main part will be arranged, The procedure will generate a

' XXXXXX. HIT' file ;

Step 4 – EXPORT USING THE HIT FILE :- Use 'Export Worksheet' and enter 'Y' option for 'Hit file' to export the required records into a 'MST.ISO' file and then import by loading into the temporary database say 'TEMP' ;

STEP 5 – RUN THE PROGRAM :- Run the program 'PERKEY'. The program ask two inputs. One, the name of the temporary database say 'TEMP', and two. The tag of the field on which the index to be generated, say '620' for keywords. The name of the database for sorting i.e. 'SORT', is default and is a must.

The program first generates a text file 'Keyword.txt' which contains a list of strings which are permuted in a cyclic manner. Then, it reads each line from the text file, and creates one record in the 'SORT' database.

STEP 6 – SORT AND PRINT FROM 'SORT' DATABASE :-

Use the 'SORT' database, and print the keyword string, V10 Sort on the same field with no. of headings = 0, 90 characters width, 55 lines per page. 'N' for no page breaks and page numbers.

STEP 7 – EDIT USING WORDSTAR :- Edit and print the index using Wordstar. Use the dot command 'CWI' to compress the text sideways. Set the right margin at 100th column and align the record numbers indicating the reference to the main entry at column no. 90. Print the index in draft mode.

NOTE :- For future use, reinitialise both the database 'TEMP' and 'SORT' before executing the above mentioned steps.

COMPILING THE PROGRAM :- Use Wordstar and choose the 'N' option (Non document mode) from the main menu. Enter 'PERKEY.PAS' as the file name. Type the program and save it.

Note the following important points.

- Do not enter the line number.
- Do not use the 'Tab Key' ; the compiler does not accept the tabulation character (ASC11 Codes) use spaces instead.
- After ';', which is the end of statement, ensure that a carriage return is given by pressing the 'Enter Key', without any space.
- Do not enter a ';' before the part of the statement 'Else' (See line no. 36 and 43).
- Assign statement.

  - If you are using version 2.3, use the following syntex Assign ('OUT' , 'NULL') ; (see line no. 71) :
  - If you are using version 2.32, use as shown in the program listing, i.e. Assign ('OUT', '') ;
  - The same applies for assign ('INP'); statement (see line no. 85).

- You may not enter the text within the braces, which are comments (see line no. 2, 24, 30, 54).

Choose the 'A' options from CDS/ISIS main menu and then the 'C' option to compile the program. Enter the file name as 'PERKEY' without any extension. If there are no compilation errors, be assured that the program will run smoothly.

PROGRAM LISTING :-

```
1       PROGRAM PERKEY

2       NAME OF THE PROGRAM ; PERKEY

2       PAS

2       PURPOSE : TO GENERATE A PER

2       MUTED KEY WORD INDEX

2

2       DEVELOPED BY : Apurba Kanjilal

2               Library and Documentation Facility

2               ISRO, SHAR Centre

2               Sriharikota – 524124

2       DATE OF LAST UPDATE : 22.04.1992)

2

2       Var

2       dbname, str, gstr : STRING ;

2       tag, r min, r max, mfn, fl, n, x, y, z : REAL;

2

2

2       PROCEDURE DB  OPEN;

3

3       Begin

4               Clear

5               Box (5,10, 5, 60, 2):

6               Cursor (7, 15);

7               Write ('Enter Database Named :');

8               Readln (dname);

9               Open (dname);

10      End;
```

```
11

11      PROCEDURE GETTAG;

12

12      Begin

13      Clear

14              Box (5,10,5,60,2);

15              Cursor (7,15);

16              Write ('Enter Tag Number (Ex. 620) :');

17              Readln (tag);

18      End;

19

19

19      PROCEDURE GENKEY;

20

20      Begin

21              mfn : = Record (r min);

22              n :      = Nocc (tag);

23              x :      = O;

24

24              Repeat                  [String]

25                      x : = x + 1;

26                      y : = 0;

27                      z : = x ;

28                      str : = " ;

29                      gstr : = " ;

30                      Repeat (Sub – String)

31                      y : = y + 1;

32                      Str : = Field (Field.n (tag, z));

33
```

```
33          If (z +1) > n then
34          Begin
35                  Z : = (n – (n-1));
36          End
37          Else
37          Begin
38          Z : = z + 1;
39          End ;
40
40          If y = 1 then
41          Begin
42                  gstr : = str;
43          End
44          Else
44          Begin
45          gstr : = gstr 1 ', ' 1 str;
46                  End
47      Untill y = n;
49      gstr : = gstr 1 ' ' 1 Encint (rmin, 1);
50      Writeln (Out, gstr);
51      Untill x = n;
53      End;
54
54      Begin           (Main program begin here)
55              DBOPEN ;
56              GETTAG;
57
57              Assign ('OUT', 'KEYWORD. TXT');
58              R MAX : = maxmfn;
```

```
59          R max : = (r max –1);

60          R min : = o ;

61          Clear ;

62          Box (8,20,5,37,2);

63          Clear box (8,20,5,37,2);

64          Attr ( ‘  ‘, 2, 10, 22, 32);

65          Write ('PLEASE WAIT ! GENERATING

65          STRING');

66          Repeat

67                  r min : = r max + 1;

68                  GENKEY ;

69           Until rmin = r max;

71          Assign ('OUT');

72

72          Open ('SORT');

73          Assign ('INP', 'KEYWORD. TXT');

74          Clear;

75          Box (8,20, 5, 37,2);

76          Clear box (8,20, 5, 37, 2);

77          Attr ( ‘   ‘, 2, 10, 22, 32);

78          Write ('PLEASE WAIT ! GENERATING

78          SORT DB');

79

79          Repeat

80                  Readln (inp, str);

81                  mfn : = NEWREC;

82                  fl : = Fldadd (10, 1, str);

83                  Update

84              Until EOF(INP);
```

85	Assign ('INP', ");
86	Clear;
87	(Box (8,20,5,40,2);
88	Clear box(8,20,5,40,2);
89	Attr (' ', 2, 10, 22, 36);
90	Write ('use sort database' sort on field V10');
91	END.

Reference : KANJILAL, (Apurba). Permuted Keyword Index Using CDS/ISIS – A tutorial : IASLIC Bulletin, Vol. 37 no. 2 June 1992.

3.2.7 Design Of A Bibliographic Database (Based on CCF) using Micro – CDS/ISIS.

A text / information retrieval system is designed to store a variety of textual and/or bibliographic information which can be accessed by one or more terms or keywords and the retrieved data can be displayed in a user-defined format. Two major characteristic features of text / bibliographic information systems are – they are designed to handle a number of fields most of which are unstructured, and they provide a wide range of retrieval facilities.

The term library automation generally encompasses two major categories to tasks performed in libraries viz. Information retrieval services and house keeping operations.

However, a text or bibliographic database is a key to both the information retrieval services and housekeeping operations in libraries. For example, library personnel and end-users will have to consult the bibliographic database for locating a

particular document in the collection, for conducting a retrospective search, or to locate the recent additions to the library's collection. Similarly, the bibliographic database, being a key to the holding of the library, needs to be consulted for various house – keeping operations like circulation control or acquisition. Therefore libraries should pay much attention to this key-the bibliographic database.

Much attention to be paid towards the design aspects in order to make one library's bibliographic database accessible to others for the purpose of resource sharing. Recently a number of measures have been taken up in India to promote resource sharing through national network (e.g., INFLIBNET) as well as regional library networks (e.g. BONET, CALIBNET, DELNET, MALIBNET, etc.). In order to achieve success toward the end of effective resource sharing, a standard framework for designing the bibliographic database is absolutely necessary. Some library networks have proposed to use the CCF (the Common Communication Format) as the standard format for holding bibliographic records, while others proposed to adopt other formats. However, experience shows that adopting the CCF as it is may not serve the desired purpose – in some cases use of all the fields proposed in the CCF makes the database too bulky; some of the fields will never be or will seldom be used. On the other hand, using the CCF strictly, librarians may find it difficult to perform some tasks with the database; some new fields may need to be added for the purpose. In other words, manipulation of data for different purposes may not be so easy in all cases using the CCF as it is.

Considering these points, measures have already been taken in other parts of the globe to adopt a database format with necessary modifications to the CCF – some fields proposed in the CCF have been discarded while some new fields have been added keeping the practical requirements in view. Outcome of one such attempt is the IDIN manual for the creation and management of a bibliographic database

using Micro-ISIS. The preparation of the IDIN manual has been sponsored by the OECD (Organisation of the Economic Cooperation and Development). Publication of the IDIN manual was influenced by another such attempt made earlier by the IDRC which gave rise to a publication called 'Manual for the preparation of records in the development of information systems.' The structure of the IDIN bibliographic database has been created for use on a micro computer using Micro-ISIS and includes guidelines for the form and contents of data according to AACR-2. It has been exchange and resource sharing among participating libraries. Mrs. Anne Di Lauro, the author of the IDIN manual, adopted the CCF fields which she found necessary and also added some fields on her own. Thus the fields defined for the IDIN bibliographic database include :

1. All the mandatory CCF fields;
2. Many of the optional CCF fields; and
3. Fields not included in the CCF but considered useful for describing non-conventional material and for in house operations.

Hence a format for designing bibliographic database using Micro-CDS/ISI is being proposed. The bibliographic database is assumed to contain book materials – books, monographs, reports, theses etc., but no serials, because it is believed that a different format for serials database might be more useful and the matter will be treated separately. The design of a bibliographic database may be useful to libraries going for automation using Micro-CDS/ISIS, and also will facilitate data exchange among libraries.

Although the basic framework for the database resembles the format proposed in the CCF, some modifications have been made. These modifications are not exactly like those proposed in the IDIN manual; rather they were made keeping the Indian library situation in view. Thus the proposed design of the database covers –

- Almost all the mandatory fields in the CCF,
- Some of the optional fields, and
- Some newly added fields which have been considered necessary.

The fields chosen for the database are mentioned in the following section. It is believed that standard bibliographic fields proposed in the CCF might not need elaborate explanation as such. However, detailed explanations have been provided with necessary illustrations, for those fields which have been added to the mandatory CCF fields. The justifications in favour of the newly added fields have been given by way of typical examples which shows the necessary measures that should be taken for a particular kind of information retrieval operation, for example providing access to a given article in a composite book through its author's name or title. In addition, typical measures to be taken to solve some particular problems in an information retrieval environment, like generation of author index, keyword index, etc., generation of added entries showing the role played by each author (joint author, editor, translator etc.), generation of a classified catalogue arranged under subject heading, etc., have been described. The proposed design of a database facilitate various information retrieval operations in libraries. The display format has been designed such that data can be displayed according to AACR-2, as far as practicable. Modifications in the display format, according to user's choice, can be made with very little effort. A model for bibliographical databases with a view to facilitate sharing of resources among Indian libraries in order to provide better information retrieval services to the users community, is being proposed here.

TABLE - 3.95

Field Definition Table (FDT)

Tag	Field Name	Length	Type	Rep	Subfields
1	Record Identifier	15	X		
15	Bibliographic level	5	X		A
20	Source of Record	25	X		A
21	Completeness	5	X		A
22	Date entered	15	X		A
31	Language/Script	20	X	R	A
40	Lang/Script of Item	20	X	R	AB
50	Physical Medium	5	X		A
60	Type of Material	5	X		A
100	ISBN	50	X	R	ABC
120	Document No.	100	X	R	AB
200	Title/Statement	300	X	R	MABL
210	Parallel Title	200	X	R	ABL
240	Uniform Title	150	X	R	ACF
260	Edition Statement	80	X		AB
300	Personal Author	100	X	R	MA
301	Collaborators	150	X	R	CETX
310	Corporate Body	150	X	R	ABDE
320	Name of Meeting	150	X	R	AGIJ
400	Place/Publisher	150	X	R	AB
440	Publ Date	20	X	R	B
460	Collation	100	X		ABCD

465	Price/Binding	25	X	R	AB
480	Series Statement	125	X	R	ABC
490	Part Statement	250	X	R	ABCF
500	Note	200	X	R	
530	Content's Note	500	X	R	AB
610	Call No.	30	X	R	ABC
611	Short code	5	X		
612	Subject Heading	55	X		
620	Descriptors	400	X		
900	Accession No.	125	X	R	

Explanation relating to the fields shown in the FDT :-

1. Record Identifier :- This field holds data which uniquely identifies a given record. Individual libraries creating the records may devise their own coding system for this purpose, e.g., 10051 which may indicate a given record bearing number 10051 in the database of a given library.

2. Bibliographic Level :- This field holds data relating to the nature of document being recorded. Five unique codes have been adopted which may be used in the subfield 'a' to denote the nature of the record., e.g.,

s = serial

m = monograph

c = multi volume monograph

a = component part

e = made-up collection

This has many uses, for example, a library may want to know how many monographs or multi-volume monograph it has in its record collection. Similarly, by looking at a given record one can determine its nature, for example, in case of a composite document that is a document having a collection of papers written by different authors, fields '015' and subfield 'a' will contain the code 'e', i.e., 'ae', by which the user can understand that it has some component parts details of which are provided in the contents note. Similarly, for a multi-volume monograph, the code 'c' will indicate that the user may look for the component parts in a subsequent field called 'part statement'.

3. Source of Record :- This field is quite useful for the purpose of resource sharing. If a library down loads data from another source, than this field will indicate that source, participating libraries may devise their own source codes.

4. Completeness of Record :- This field shows how for a given record is complete; two codes have been chosen where code 'B' indicates that the record contains data relating to all the mandating fields proposed in the CCF, while code 'C' indicates that all mandatory fields are not present in the given record.

5. Data Entered on File :- This field shows the date on which a given record is created. Subfield 'a' has been chosen which allows entry of date in the format. 'yyyymmdd'.

6. Language and Script of Record and Item :- Two different fields have been chosen to denote the language and script of an item. If an item is written in a language which differs from the language in which the record is created, the field '031' is to be used. For example, if a book is written in Bengali and its record is created in English that field '031' will contain an entry ' a eng'.

Field '040' is used for a slightly different purpose there are two subfields which are to be used when the language of an item and the script used to write that item differs; when both are same use of subfield 'a' will serve the purpose. For example, if the language of a book in English and it is written (for obvious reasons) in Roman script, field '040' will have an entry ' ∧ a eng'; if on the other hand, the language of a book is Hindi and it is converted in Roman script, the entry will be '∧ a hin∧baa' ('aa stands for Roman script in the CCF).

7. Physical Medium :- This field is particularly useful to libraries which handle multi-media documents like paper, film, braille, magnetic, laser/optical and others. Different code is used to indicate the nature of the document, for example,

010 = Paper
020 = Film
030 = Braille
040 = Magnetic
050 = Laser / Optical
060 = Other

Use of this field will facilitate identification of different kind of items and their total numbers in library's collection.

8. Type of Material :- This field denotes the nature of the material being handled, and several options are available. The code used (given in the CCF) for this field helps library to identify, for example, how many theses, reports, patents, etc, are there in the collection.

9. ISBN :- Three subfields have been chosen where

a indicates the ISBN noted on the book

b indicates the invalid ISBN

c indicates qualification, if any.

This field has been made repeatable keeping in view that a given book may have more than one ISBN-One for paper back, one for hard bound, and so on.

10. Document Number :- This field holds data relating to the number which uniquely identifies a document, for example, standard number, patent number, etc. Two subfields proposed in the CCF have been chosen where

a indicates document identification number, and

b indicates type of document, for example, Indian standard, US patent etc.

Thus this field allows one to conduct searches by the name of a given standard, patent, technical report, etc., and its number, for example, 'ISO 2709', 'IS 4001', etc.

11. Title and Statement of Responsibility :- This field holds data relating to the title of a document and statement of responsibility. Two important points need to be mentioned about this field. According to AACR-2, title and statement of responsibility area has a typical format; while names of authors, when used as heading, appear in the format 'forename follows by surname', they appear in a different form, 'forename followed by surname' in the statement of responsibility area. In addition, display of data in the statement of responsibility area sometimes becomes complex, particularly so when more than one persons are responsible for a given publication. Hence, for proper display of data according to AACR-2, it is proposed that while entering data in

this field, the pattern in which they appear on the title page should be followed. Four subfields have been suggested for this field, viz.

m = when title is used as main heading

a = when title is not used as main heading

b = statement of responsibility

l = language of title

Subfield 'm' and 'a' have some special significance. For proper display and/or printing of data in the AACR-2 format, the system should be able to determine automatically when the title is to be used as main heading and when not, because a separate rule is there in the AACR-2 for the purpose of data identification. Besides the system should be able to identify when title is used as the main heading and when author is used as main heading (see also section 15). The subfield 'm' and 'a' serve this purpose. In a classified list of documents, prepared for the Current Awareness Service, say, entries under main heading are considered only. In that case the system should be able to determine automatically when title has been used as a main heading. Again, for proper display, it is proposed that when title is used as main heading, the first word in the title should be entered in uppercase. Examples illustrating how the use of subfields 'm' and 'a' facilitates data display appear in Annexures 1 and III. This is an addition to the format proposed in CCF, because CCF does not, as such, provide any such facility and hence it becomes difficult for the system to determine automatically when main entry will be under title.

12. Parallel Title :- This field holds data when an item has a parallel title and three subfields have been proposed, viz.

a = if title is available in other language

b = statement of responsibility associated with the parallel title.

l = language of parallel title

Example illustrating parallel title appears in Annexures I and III.

13. Uniform Title :- Three subfields have been chosen for this field which are –

a = uniform title

b = name of part (s)

f = version

Example showing uniform title appears in Annexures I and III.

14. Edition Statement :- Two subfields have been chosen, viz.

a = edition

b = editor (when responsible for the particular edition).

This field has been made repeatable keeping in view that a given document may have more than one edition statements associated with it.

15. Personal Author :- There are two subfields which indicate when an author should appear as main heading and when not. The subfields are –

m = when author is used as main heading

a = when author is not used as main heading

This arrangement serves two purposes. First it enable the system to know whether the author of a given item should appear in the main This arrangement serves two purposes. First it enable the system to know whether the author of a given item should appear in the main heading and thus it can display the entries accordingly. Second, when an item has more than one authors, the system by looking at the subfields can determine when the qualifier it. author is to be written against the author's name while generating added entries. This facility is not available in the CCF, as such and therefore it is an extension. Examples illustrating the utility of the subfields appear in Annexures I, III and IV.

16. Collaborators :- As mentioned in section 11, this design allows to enter statement of responsibility relating to a given work along with its title in field '200'. It also allows to enter names of collaborators, if any, in its normal form, i.e., 'forename followed by surname', without any preceding subfield delimiter. A question may then by raised how would one find a document if he only knows the name of a collaborator, say name of compiler, translator, or editor ? Again how would the system generate added entries under these collaborator names ? CCF proposes the use of a subfield 'f' under field '300' to denote the role of an author. However, this causes data redundancy to some extent, because one has to enter the role of each and every author, that is, one has to use two subfields simultaneously – subfield 'a' for author's name and subfield 'f' to denote the role played by that author. In order to simplify the process, a new field (not proposed in the CCF) has been added. Field '301' holds data relating to the names of collaborators in four subfields, viz.

c = compiler's name.

e = editor's name

t = translator's name

x = others

Thus any name(s) occurring under subfield 'c' will indicate that the contributor is a compiler; similarly subfield 'e' denotes editor, 't' denotes translator, etc. For other contributors subfield 'x' has been proposed; however, new subfields may be added, if necessary. It is proposed that data should be entered here in the format – 'surname followed by forename: use of this field helps in –

- searching by collaborator's name;
- generating added entries under collaborators;
- pointing out the role of the collaborators, e.g., ed., comp., tran., etc.

Examples illustrating collaborators appear in Annexure V and VI.

17. Corporate Body :- It is felt that the following four subfield can accommodate the data elements which are necessary to denote corporate bodies.

a = main body
b = sub – body
d = city / address
e = country

Example relating to corporate body appears in Annexures 1 and III.

18. Name of Meeting :- This field is used when a item is recorded under the name of a conference, seminar, workshop, meeting, etc. Four subfields have been chosen, viz.

a = name of meeting
g = location

i = date of meeting

j = number of meeting

Thus depending on the way the database is indexed, one can search information relating to a seminar by its name, by name and number for example 'Informatics 8', by name and location and/or date, and so on.

19. Publication Details :- Two separate fields have been chosen for this purpose where '400' holds data relating to place of publication (subfield 'a') and name of publisher (subfield 'b') while field '440' holds data relating to the year of publication in subfield 'b' which, according to the CCF, can hold date in the free form.

20. Physical Description :- The collation statement is entered in this field. It has been taken as it is in the CCF. Each item of information is entered in a different subfield like

a = number of pieces or pagination

b = other descriptive details

c = dimension

d = accompanying materials

21. Price and Binding :- This field holds data relating to the price and binding details of an item in two subfields, viz.

a = price

b = binding

This field has been made repeatable because sometimes a book shows different prices for different bindings, for example one price tag for the paper back and another price tag for hard bound.

22. Series Statement :- Data relating to a series can be help in three subfields, viz.

a = series name
b = statement of responsibility
c = part statement

Other subfields in the CCF are not felt necessary.

23. PART STATEMENT :- This field hold data when a multivolume book is entered. Thus from this field one can get brief information about the different parts of a multi-volume book. This field has been made repeatable because a given book may have more than one volume or parts. Four subfields have been chosen to hold data relating to each part, e.g.,

a = volume/part number
b = pagination defining a part
c = title and credibility
e = year

Subfields 'a' and 'b' have been taken as it is in the CCF; subfield 'c' has been modified and subfield 'e' has been added keeping specific requirements in view. It may be noted that a given part of a multi-volume work is treated as a specific entity and therefore separate entry for each component part may be prepared. This will serve two purposes. First, this will allows users to search by any key like author, title word, keyword, accession number, etc., of the main document as well

as those of each component part. Thus when the sought key will belong to the host or the main document, the display will not only show the main document but it will also show brief detail of each component part. Similarly, when the search key is related to any component part, the display will show details of the component volume and its note section will also provide brief information about the host document. Thus both way relationship (vertical and horizontal) can be represented. The second advantage of creating separate entry for each component part is that separate catalogue entries and author indexes can be generated thereby showing information about the component parts as well the host document.

24. Notes :- Two different fields have been chosen the hold data relating to notes – field '500' to hold general notes and field '530' to hold field about contents. CCF proposed a subfield 'A' for the field '500'. However, it is felt that no subfield is required general notes can be entered according to the user's choice.

Field '530' has been chosen keeping particularly composite documents in view. While recording a composite book, i.e., a book having a number of articles written by various authors or a seminar or conference volume etc., the library may want the record information relating to each article. CCF proposes only one subfield, for the field '530' ; but is felt that this serves only a limited purpose. Hence, three subfields have been proposed for the field '530' ' viz.

a = title
b = credibility
c = pages

Each of these three subfields has been made repeatable to hold data for all the component articles/papers in a composite document.

Thus users can search for a given article in a composite document in two ways :

(1) by approaching through keys like name of editor, title, etc. of the host document, display of which will show all the component articles appearing in the contents notes (for example see Annexure 1);

(2) by approaching through title words or by the first author name (actually truncating after the first author's name) a can display the record.

The present design does not make any provision to conduct a search through the second and subsequent author's name component articles. One has to make a minor modification in the design to achieve this target – a separate repeatable field is to be created which will hold names of all the authors appearing in all the component articles in a composite document.

25. Call Number :- Three subfields have been chosen to hold data relating to call number, viz.

a = notation, i.e., class number

b = classification scheme

c = author mark

The subfield 'c' has been added to serve a specific purpose. A clever approach to generating inverted index with allow users to search document by their call numbers which are a combination of class numbers and author marks. Thus the document can be searched by class numbers as well as by call numbers.

26. Sort Code and Subject Heading :- Two new fields viz. '611' and '612' have been added for data relating to 'sort code' and 'subject heading' for two specific reasons. Generation of a classified list of documents is a very common

function in libraries. However, experience in CDS/ISIS shows that if document records are sorted on the basis of their class numbers, the resulting list does not always conform to the strict classified order proposed in the code followed (UDC, say). This happens because within the computer system items are sorted according to their ASC II codes which differ from the (sort) order proposed in the classification schemes. This can be avoided if a sort code list is generated for use in the library and depending on the class number of the document being recorded, the appropriate sort code from the list is entered in the 'sort code' field. This will facilitate proper sorting of document records in classified order.

A library may again require to sort the document records in its collection in a classified order but at the same time they may want to display them under subject headings so as to make the list more intelligible to general users. The problem here is-if the document records are sorted simply by their subject headings, related items will disperse owing to their alphabetical values. For example, item on 'Networking' will be placed under 'N', while 'LAN' will be placed under 'L' and those on 'WAN' will go under 'W'. The present design proposes a method by which two fields, viz 'sort code' and 'subject heading' will be used in conjunction to sort the document records in a classified order while they will be displayed under subject headings; thus related items will appear together under an appropriate subject heading. Examples illustrating this appear in Annexure II.

27. Descriptors :- This field allows to enter assigned descriptors to the document records. For obvious reasons it has been made repeatable in the CCF; two subfields have also been provided. However, for simplification the present design does not propose the use of any subfield; instead it proposes that each descriptor should be enclosed in angular brackets for extraction of data elements for the purpose of database indexing.

28. Accession Number :- This is also an added field (i.e., not proposed in CCF). This field has been made repeatable keeping a particular requirement in view. For example, in case of multi-volume book, there will be one entry for host document, and each separate volume/part, being a separate entity, will have different accession numbers. All these accession numbers may be entered in field '900'. One may however, argue that with this measure we may loose one unique advantage –if each record would have only one accession number, simply by looking at the MFN we could say how many records have been created; but this is not possible if some records contain more than one accession numbers. This issue has been considered and it is proposed that a simple measure by sorting and printing will enable us not only to know how many document records have been entered into the database, but we may also be able to print the accession numbers of those documents. However, as mentioned in section 23, separate entry for each component of a multi-volume document is to be made.

LIBRARY OPERATIONS :- A number of library operations can be performed with the proposed design. First and foremost is the resource sharing. This is possible provided all the participating libraries adopt this design format with as little modification a possible. In addition to the sharing of resources, the present design will help each library to perform a number of operations, each being performed automatically by the CDS/ISIS software. Some of the most common library operations which can be performed with the proposed design are mentioned in the following subsections.

1. Information Retrieval Operations :- Micro-CDS/ISIS, being specifically designed for the purpose, allows one to perform almost all kinds of information retrieval operations in libraries. It may be noted that the present design does not propose to use abstract field in the database, because normal catalogue-

based information retrieval operations in libraries do not require abstract field; moreover, addition to abstract field for each document in libraries will make the database to bulky. However, it may add 'abstract' field to the database, if so desired

The present design will enable libraries to conduct searchers on any of the following keys:

- author's name-personal as well as corporate;
- name of joint authors and collaborators;
- name of author of an article in a composite document, or a multi-volume document;
- name of a meeting/seminar/conference, etc. as well as name of a report and its number, patent and its number, standard and its number, and so on;
- title of a document – a monograph, a multi-volume book a seminar or report, etc., as well as uniform and parallel title;
- type of material like theses, report, film, etc;
- keywords, class numbers and call numbers, etc.

Key values for each of these fields can be used as search either alone or in combination with other terms using Boolean operators. The powerful search system of CDS/ISIS will retrieve the necessary documents by approaching through any access key and the retrieved records can be displayed in AACR-2 format. The display and printing of records in appropriate AACR-2 format is possible by a display format designed for the purpose. Searches by the author name and/or title of the component articles in composite documents or multi-volume works retrieve and display the records showing the sought document along with the host document.

2. Printed Catalogues :- Libraries may often require to generate printed catalogues of different kinds. For example, they may want to produce a complete catalogue of documents arranged alphabetically showing main as well as added entries; or they may want to produce the same for a particular kind of document like theses, reports etc. The present design enable printing of such catalogues in AACR-2 format where main entries can be generated under personal author, corporate author, title, uniform title, name of meeting/conference, etc. as appropriate, for each given document according to AACR-2. Measures have been taken to facilitate generation of such printed catalogues simply by calling a print format designed for the purpose. The catalogue entries also show the role of authors like it. auth., tran., ed., comp., etc. as the case may be Annexure I, IV, V and VI present examples of such catalogue entries. It may be noted that the documents recorded in the database were hypothetical and therefore users are adviced not to take any field value in its literal meaning.

The present design also enables libraries to generate printed classified catalogue where documents may be arranged alphabetically under major class headings. Annexure Ii presents examples of classified catalogue entries.

3. Indexes :- Libraries may often wants to produce printed indexes under author, subject, keywords, etc. Annexures VII and VIII illustrate such indexes. Measure suggested in section 24 will enable libraries to generate index entries under names of each author of the component articles, thereby displaying both the article sought and host document. Similarly, measures suggested in section 23 will enable libraries to generate index entries under name of each author of the component parts of a multi-volume document, thereby displaying both the part/volume sought and the host document.

4. Accession List :- Libraries may want to maintain a hard copy of the accession list where document record will be arranged according to accession numbers and will be display in full according to AACR-2. Annexure II displays an accession list :

The above discussion justify that the proposed design of the bibliographic database will enable Indian libraries in participating in networks for the purpose of resource sharing as well as for performing a number of information retrieval activities. Necessary extensions to the CCF have been made in order to achieve better performance, while some of the CCF fields have been discarded in order to maintain simplicity. The proposed design is expected to serve the purpose of all kinds of Indian libraries. However, owing to the specific nature, some library may want to make some changes in the design, such changes will not clash with the proposed design as long as same field tags are not used for an entirely different purpose; rather libraries may add new fields in order to achieve better performance, though such extensions should be made carefully. The present design has been formulated to creat a general framework where most Indian libraries can be accommodated to achieve an optimum level of performance and standardization.

ANNEXURE – I

SAMPLE CATALOGUE ENTRIES

Bible. Old Testament. Hindi.

New holy Bible containing old testament/translated by

James Moffat. – London : Thomas, 1965.

205 p. : 24 cm.

Bible is translated into Hindi

ISBN 00-3733-98.   220,52

Acc no. 14567.

Carlson Verne

Professional lighting handbook/verne carlson and Sylvia. .

Carlson ; with a forward by David Quadid. – Boston : Focal Press, 1986

xxi. 242p. : ill., tabs; 21 cm. – (Popular photography Series, no. 2: V1

Wilson)

ISBN O – 53476-526-4

ACC NO. 16699.   771.44 (02)

DECISION maker's guide to videotext and teletext/comp. by

CE Abraham – Preliminary ed. – Paris : UNESCO, 1986.

V, 91 p. : ill.; 30 cm.

ISBN 0 – 82514-287-9

ACC NO. 16873   681.32 : 621.39 (036)

INFORMATION retrieval research/edited by RN Oddy.

SE Robertson, CJ Van Rijsbergen and PW Williams – London :

Butter worths 1981.

Contents :

Brooks BC. Information technology and the science of informations.

Salton G and WU Harry. A term weighting model based on utility theory.

Shank RC. Kolodner JL and Dejong G. Conceptual

Information retrieval.

ISBN 0 – 408-10775-8.

ACC NO. 52967   029.54

Nisevich, N1

Infektsionnuie bolezni U detei/by NI Nisevich and VF Vehalkin = Infectious diseases in children/translated by M1 Michurin. – Moscow : Meditsina, 1985.

265 P. : ILL. : 22 CM.

Contains English abstract

Contains bibliographies

ISBN 0 – 14624-510-2   616.9-053.2

ACC NO. 27481

United Kingdom. Parliament. House of Commons.

Public Libraries and Museums : a bill to place the public library service provided by local authorities in England and Wales under the superintendence of the Minister of Education ……….. / Presented by Sir Edward Boyle : supported by Quinti Mogg……… (et al.)… - (HC.) Bill. (1963-64)67)

ISBN 0-85365-649-5

ACC NO. 23456   340

UNIVERSAL decimal classification – Internation Medium

ed. – London : British Standard Institution, 2 pts.

Pt. 1 : Systematic Tables. – 1985. – xiii, 494 p.

Pt. 2 : Indexes. – 1986 – xi, 395 p.

BS 1000 M, Part 1

English Text

ISBN 0-59413-158-4

ACC NO. 16670; 16671   025.45

WORKSHOP on Management of Information Services (1983 May 9-21; Arusha :

Tanzania)

Management of information services : report/edited by Lutz Hutttemann. –

Bonn :

(s.n.), 1983.

ii. 94 p.; 21 cm.

Contains 15 refs

ISBN 089345-256-2   002 : 65.01 (082.2)

ACC NO. 16947.

ANNEXURE – II

CLASSIFIED CATALOGUE

(arranged under subject heading)

DOCUMENTATION

WORKSHOP on Management of Information Services (1983) May 9-21; Anisha: Tanzania)

Management of Information services : reports/edited by Lutz Hutteman – Bonn : (s.n.). 1983.

II,94p.; 21 cm.

Contains 15 refs.

ISBN 0-89345-256-2   002 : 65.01(082.2)

ACC NO. 16497

LIBRARIANSHIP

INFORMATION retrieval research / edited by RN Oddy, SE Robertson, CJ Van Rijsbergen and PW Williams – London : Butter worths 1981.

Brooks BC, Information technology and the science of information Salton G and

Wu Harry, A term weighting model based on utility theory.

Shank RC. Kolodner JL and Dejong G, Conceptual information retrieval

ISBN 0-408-10775-8

ACC NO. 52967.   029.54

UNIVERSAL desimal classification – International Medium – London :

British Standard Institution, 2 pts.

Pt. 1 : Systematic Tables – 1985 – xiii, 494 p.

Pt. 2 : Indexes – 1986 – xi, 395 p.

BS 1000 M, Part 1

English Text

ISBN O – 59413 – 158-4

ACC NO. 16670; 16671   025.45

RELIGION

Bible. Old Testament. Hindi.

New holy Bible containing Ols Testament / translated by James Maffat. –
London : Thomas, 1965.

205. : 24 cm.

Bible is translated into Hindi

ISBN 00-3733-948

ACC NO. 14567   220.52

SOCIAL SCIENCES

Untied Kingdom. Parliament. House of Commons

Public Libraries and Museums : a bill to place the public library service
provided by local authorities in England and Wales under the superintendence of

the Minister of Education …….. / Presented by Sir Edward Boyle ; supported by Quinti Hogg ……… (et al.). – London : H.M.S.O., 1964.

III, 17 p.; 25 cm., - (H.C.) Bill, (1963-64)67)   340
ISBN 0-85365-649-5
ACC NO. 1234.

PATHOLOGY

Niserich, N1

Infektsionnuie bolezni U deteri/by N1 Nishevich and VF Uchalkin = infectious disease in children / translated by M1 Michurin – Moscow :

296 p. : ill.; 22 cm.
Contains English abstract
Contains bibliographies   616.9-053.2
ISBN 0-14624-510-2
ACC NO. 27481.

COMPUTER AND DATA PROCESSING MACHINE

DECISION Maker's guide to videotex and teletex/comp. by
CE Abraham. – Preliminary ed. – Paris : UNESCO, 1986
V, 91P. : ill. : 30 cm.
ISBN 0-82514-287-9
ACC NO. 16873.   681.32 : 621.39 (0.36)

PHOTOGRAPHY

Carlson, Verne

Professional lighting handbook/verne Carlson and Sylvia Carlson : with a forward
by David Quaid. – Bostan : Focal Press, 1985. Xxi, 242 p. : ill., tabs : 21 cm. –
(Popular photography series. No. 2: V.1 Wilson)

ISBN 0-53476-525-4

ACC NO. 16699   771.44 (02)

ANNEXURE III

ACCESSION LIST

(1234)

United Kingdom. Parliament. House of commons

Public Libraries and Museums : a bill to place the public library service provided by local authorities to England and Wales under the superintendence of the Minister of Education...../Presented by Sir Edward Boyle; supported by Quants Hogg........ (et al.) – London : H.M.S.O., 1964.
Iii, 17 p.; 25 cm. – ([H.C.) Bill, [1963-64] 67)

(14567)

Bible. Old Testament. Hindi.
NEW HOLLY BIBLE CONTAINING LD TESTAMENT/TRANSLATED BY JAMES MAFFAT. – LONDON : THOMAS, 1965.

205 P.; 24 CM.
BIBLE IS TRANSLATED IN HINDI
ISBN 00-3733-948   220.52

(16670)

UNIVERSAL DECIMAL CLASSIFICATION – INTERNATIONAL MEDIUM ED. – LONDON : BRITISH STANDARD INSTITUTION, 2 PTS.
PT. 1 : SYSTEMATIC TABLES. – 1985. – XIII, 494P.
ENGLISH TEXT
ISBN 0-59413-154-4   025.45

CARLSON VERNE   (16699)

PROFESSIONAL LIGHTING HANDBOOK/VERNE CARLSON AND SYLVIA CARLSON :
WITH A FORWARD BY DAVID QUAID. – BOSTAN : FOCAL PRESS, 1985.

XXI, 242 P. : ILL., TABS; 21 CM., - (POPULAR PHOTOGRAPHY SERIES, NO. 2 ¨VI
WILSON

ISBN 0-53476 – 526-4   771.44(02)

DECISION MAKER'S GUIDE TO VIEDEOTEX AND TELETEXT/COMP. BY CE ABRAHAM.
– PRELIMINARY ED. – PARIS : UNESCO, 1986.

ISBN 0-82415-287-9   68.32 : 621.391 (036)

                                                (16947)

WORKSHOP ON MANAGEMENT OF INFORMATION SERVICES (1983 MAY 9-21;
ARISHA : TANZANIA)

MANAGEMENT OF INFORMATION SERVICES : REPORT/EDITED BY LUTZ HUTTEMANN.
– BONN (S.N.), 1983.

II, 94P.; 21 CM.

CONTAINS 15 REFS.

ISBN 0-89354-256-2   002 : 65.011 (082)

                                                (27481)

NISEVICH N1

INFEKTSIONNUIE BOLEZNI DETEL/N1 NISHEVICH AND VF UCHALKIN = INFECTIOUS
DISEASE IN CHILDREN/TRANSLATED BY M1 MICHURIN. – OSCOW ¨MEDITSINA, 1985.

296P. ; ILL ; 22 CM.

CONTAINS ENGLISH ABSTRACT

CONTAIN BIBLIOGRAPHIES

ISBN 0-16424-510-2   616.9-053.2

(52967)

INFORMATION RETRIEVAL RESEARCH/EDITED BY R.H. ODDY, SE ROBERTSON, CJ

VAN RIJSBERGEN AND PW WILLIAMS. – LONDON ¨BUTTER WORTHS & CO., 1981.

CONTENTS :

BROOKS BC, INFORMATION TECHNOLOGY AND THE SCIENCE OF INFORMATION

SALTON G AND WU KARRY, A TERM WEIGHTING MODEL BASED ON UTILITY THEORY

SANK RC, KOLONER JL AND DEJONG G. CONCEPTUAL

INFORMATION RETRIEVAL.

ISBN 0-408-10775-8   029.54

ANNEXURE IV

SAMPLE ADDED ENTRIES

(UNDER JOINT AUTHOR)

CARLSON SYLVIA. JT. AUTH.

CARLSON VERNE

PROFESSIONAL LIGHTING HANDBOOK/VERNE CARLSON AND SYLVIA CARLSON :

WITH A FARWARD BY DAVID QUAID. — BOSLAN : FOCAL PRESS, 1985. XXI, 242P. :

ILL.; 22 CM. — (POPULAR PHOTOGRAPHY SERIES. NO. 2: V1 WILSON)

ISBN 0-53476 — 526-4

ACC NO. 16699   771.44 (02)

UCHALKIN VF. FT. AUTHOR

NISHEVICH N1

INFEKTSIONNUIE BOLEZNI U DETEI/BY N1 NISEVICH AND VF UCHALKIN =

INFECTIOUS DISEASE IN CHILDREN/TRANSLATED BY M1 MICHURIN. — MASCOW :

MEDITSINA, 1985.

296P. : ILL.; 22 CM.

CONTAINS ENGLISH ABSTRACT

CONTAIN BIBLIOGRAPHIES.

ISBN 0-14624-510-2   616.9-053.2

ACC NO. 27481.

ANNEXURE V

SAMPLE ADDED ENTRIES

(UNDER EDITORS

HUTTEMANN LUTZ, ED.

WORKSHOP ON MANAGEMENT OF INFORMATION SERVICES (1983) MAY 9-21 :

ARUSHA : TANZANIA

MANAGEMENT OF INFORMATION SERVICES : REPORT / EDITED BY LUTZ

HUTTEMANN. – BONN : (S.N.), 1983.

II, 94 P.; 21 CM.

CONTAINS 15 REFS

ISBN 0-89354-256-5

ACC NO. 16947.   002.65.011 (082.2)

ODDY RN, ED.

INFORMATION RETRIEVAL RESEARCH/EDITED BY RN ODDY, SE ROBERTSON, CJ VAN

RIJSBERGEN AND PW WILLIAMS – LONDON : BUTTERWORTHS CO., 1981.

CONTENTS :

BROOKS BC, INFORMATION TECHNOLOGY AND THE SCIENCE OF INFORMATION.

    SALTON G AND WU HARRY, A TERM WEIGHTING MODEL BASED ON UTILITY

    THEORY. SANK RC KOLODNER JL AND DEJONG G, CONCEUAL INFORMATION

    RETRIEVAL

    ACC NO. 52967.   029.54

ROBERTSON SE, ED.

INFORMATION RETRIEVAL RESEARCH/EDITED BY RN ODDY, SE ROBERTSON. CJ VAN

    RIJSBERGEN AND PW WILLIAMS – LONDON : BUTTER WORTHS CO., 1981.

CONTENTS :

BROOKS BC, INFORMATION TECHNOLOGY AND THE SCIENCE OF INFORMATION.

    SHALTON G AND WU HARRY, A TERM WEIGHTING MODEL BASED ON UTILITY

THEORY. SHANK RC KOLODNER JL AND DEJONG G, CONCEPTUAL

INFORMATION RETRIEVAL.

ISBN 0-408-10775-8

ACC NO. 52967.   029.54

VAN RIJSBERGEN CJ, ED.

INFORMATION RETRIEVAL RESEARCH/EDITED BY RN ODDY, SE ROBERTSON,

CJ VAN RIJSBERGEN AND PW WILLIAMS – LONDON : BUTTER WORTHS & CO.,

1981.

CONTENTS :

BROOKS BC, INFORMATION TECHNOLOGY AND THE SCIENCE OF

INFORMATION. SALTON G AND WU HARRY, A TERM WEIGHTING MODEL

BASED ON UTILITY THEORY. SHANK RC KOLODNER JL AND EJONG G,

CONCEPTUAL INFORMATION RETRIEVAL.

ISBN 0-408-10775-8   029.54

ACC NO. 52967.

WILLIAMS PW, ED.

INFORMATION RETRIEVAL RESEARCH/EDITED BY RN ODDY, SE ROBERTSON, CJ VAN

RIJSBERGEN AND PW WILLIAMS – LONDON :

BUTTERWORTHS & CO., 1981.

CONTENTS :

BROOKS BC, Information technology and the science of information. Salton G and

Wu Harry, A term weighting model based on utility theory. Shank RC, Kolodner

JL and Dejong G, Conceptual information retrieval.

ISBN 0-408-10.775-8

ACC NO. 52967   029.54

ANNEXURE VI

SAMPLE ADDED ENTRIES

(Under Translators

Moffat. James, tran.

Bible. Old Testament. Hindi.

New holy Bible containing Old Testament / translated by James Moffat. – London
: Thomas, 1965.

205 p. ; 24 cm.

Bible is translated into Hindi

ISBN 00-3733-948

ACC NO. 14567.   220.52

ANNEXURE VII

SAMPLE AUTHOR INDEX

Abraham, CE   Oddy, RN

16873   52967

Bible   Quid David

14567   16699

Boyle Edward   Robertson SE

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Carlson Sylvia
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Huttemann Lutz
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Moffat James
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Nisevich N1
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Uchalkin VF
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Van Rijsbergen CJ
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William PW
52967

ANNEXURE VIII

Simple Keyword Index

Bible
14567
Bill, Museum
1234
Bill, Public Library
1234
Children, Infectious disease
27481
Classification, decimal
16670, 16671
Information Science
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Information Service: management
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Public library : Wales
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Pathology. Infectious disease

27481

Pedagogics

27481

16670, 16671

Videotext

16873

DESIGN AND DEVELOPMENT OF SYSTEMS IN LIBRARIES OF IITs

4.1) Elements of System

System requirements forms basis for system design specifications. Design document provides details on following three basic elements of computer system –

4.11) Hardware;

4.12) Software; and

4.13) Humanware.

4.11 Hardware :

By computer Hardware is meant the physical units which constitute the machine named computer. A computer system consists of a number of individual components, each performing a particular function. The basic system consists of a number of electronic equipments which work together to form the computer. Thus the physical, electronic and electro-mechanical components of the computer system are called Hardware. But keeping in view the objectives of this study the engineering of Hardware will not be appropriate. Instead the type of computers installed, their number and capabilities are the aspects considered relevant from the angle of automating the library services.

4.12 Software :

Generally the software is a set of instructions or programs written or developed to enable the computer to do desired operations. From the angle of this study only application software packages for library operations are to be considered. An application software package contains modules for all the specific activities that may concern a particular user group, e.g. an Application Software Package for library work contains modules for acquisition work, cataloguing, circulation, serial control, information storage and retrieval etc.

Selecting and Acquiring Application Software Package :

Though there are good reasons in support of acquiring a software package from a reputed agency rather than developing one in-house as for as most of the libraries are concerned. But the libraries of Indian Institutes of Technology have a different picture for the reasons that –

a) The libraries are special and belong to a parent organisation having a good team of computer scientists and engineers.
b) The libraries have huge collection and being used heavily had felt the need of automation almost two decades back.
c) The automation was planned in different stages using computer for various activities of the library.
d) The non-availability of application software packages for libraries to meet all the needs of such libraries.
e) Availability of different computer systems in different libraries.

It is for these reasons that the IIT libraries which made an attempt to automate some 15-20 years back had to struggle for years together to develop in-house

software package to meet the individual library's needs and to suit with the available computer system. I witnessed the same in IIT, Mumbai, a team of most efficient computer scientists, Prof. (Dr.) H.B. Phatak and Dr. (Mrs.) Date worked with Mrs. V.S. Subbarao, I/C of periodical section from 1980 to 1986 to develop an application software for serial control on a trial and error basis to run it on EC 1030, a computer of third generation. It took them more than six years to run a program successfully on their system. Later in 1988, with the introduction of PC/AT, a menudriven system 'PUSTAK' was developed for circulation activities. For acquisition 'POORTI' was developed in house. For serial control a readymade package 'SLIM' was acquired. The library of IIT, Kanpur developed 'IIT-KLAS' in-house on ORACLE RDBMS version 7.0. It has 'LEKHYA'- An acquisition module, 'SUCHI' – The cataloguing module, 'CIRCULATION', 'PATRIKA' – a serial control module. It also developed an on-line Academic Information centre.

The Library of IIT, Delhi after struggling enough to develop software in-house acquired 'LIBSYS' to computerise the library activities.

The library of IIT, Chennai has developed softwares on ISQL and ORALE. While the library of IIT, Kharagpur acquired LIBSYS for various activities.

Qualities of a Library Application Software :

Before acquiring a software package it is essential to ascertain whether or not the software package is of optimum usefulness for the library. An efficient software package for libraries should have the following qualities :-

    i)   DBMS Features

    ii)   High Level Integration

    iii)   Date Entry Facility

iv)   Date Updating / Editing

v)   Search / Inquiries

vi)   Report / Display / Print

vii)   Menu – Driven and User Friendly

viii)   Compatibility

ix)   Reputation of the Sponsoring Agency

x)   Scope for local variation.

It may be relevant to give here a brief description of some important qualities –

DBMS Features :- It refers to a software that is developed for creating, organising, manipulation managing and arranging data in a data base. A DBMS creates inverted and other relevant files to facilitate search and retrieval of information. Word Star does not possess DBMS.

High Level Integration :- Software package for library work should incorporate various modules for different types of activities like circulation, acquisition, serial control, documentation etc. Since almost same basic bibliographical data is used in various modules, the package should possess high level integration to connect all the modules so that the data entered once in any module may be accessed and used automatically in other modules as and when needed.

Data Entry and Updation :- In each module except OPAC (On-line Public Access Catalogue) there should be provision for data entry and updation/editing. But at the same time it should have a facility for protection of these facilities so that only bonafide users may enter or update the data.

Search Facility and Report :- A library application software package should have very efficient and effective search facility under various modules by providing the

user at one place facility for putting any query. Results of the search or report to the query should be instantaneously displayed or printed.

Menu driven and Easy to Use :- The package should have been developed in such a way as it can be used even by a layman with a short training. If the user is held up somewhere the package should offer help messages. Detailed and adequate menues and sub-menus should be provided. It means that library application software package requires not only high level programing (language) but also the skill to visualise the complex and compound requirements of the library staff and users.

Compatibility :- It means the quality to merge the data bases created by other standard softwares or to be merged with other data bases created by other software. In other words the packages must adhere to Common Communication Format (C.C.F.) and international standards.

Reputation of Sponsoring Agency :- Before acquiring any software package the agency responsible for the development / distribution of the software package, must be assessed on the basis of certain factors like standing of the Agency or its Agent, location, and number of service points, quality of software and services as testified by previous customers, etc.

Local Variation :- In order to meet the requirements of individual libraries, which obviously differ from library to library, the software should provide scope for incorporating local variation and also provision for changing tag number etc. in standard number to enable the particular library to take part in computerized networks.

Software Packages for Library Operations :- Initially the general purpose program packages with some modifications were used for Library Operations, but later it was realised that separate and specific packages should be developed for library operations. IBM was perhaps the pioneer, in this regard, to develop the STAIRS (Storage and Information Retrieval System) package which was a main frame version. During last few decades number of software packages for library operations had been developed and being marketed on national and international levels. In fact it is not possible to have a correct account of all such software packages. However, CDS/ISIS, SUPERDOC, IV + V System, SCI-MATE, CAIRS, INMAGIC, MINISIS AND LIBSYS etc. are the most popular packages used for library operations. The principal features of these and a few more packages are as follows –

A) **WORD STAR** – Though not a library application package yet it is useful for libraries in many ways.

It is one of the most popular word processing software because of its user-friendly nature and simple commands. While working on Word Star necessary commands, functions and messages are displayed on the screen for the help of the users. It does not have Data Base Management capabilities, but is useful for libraries.

Word Star can be used –
   a) To type a text;
   b) To store the text in internal/external memory/ storage medium;
   c) To edit the typed/stored text i.e. to correct mistakes, change, update, or delete any stored text;
   d) To increase/decrease space between two lines / paragraphs;
   e) To increase / decrease the margin (Right and Left);
   f) To do all these jobs without disturbing the remaining part of the text;

g) To search/trace the desired portion of the text and replace it with other text;

h) To search for spelling mistakes and correct them automatically;

i) To do mail merge work;

j) To do cut and paste work;

k) To do other improvements eg. Bold, underline, lower, upper etc;

l) To display print or delete/erase a text or file.

B) **dBase III Plus :-** It is the third version of DBMS series for micro computers from Aston– Tate Corporation of USA. It is an user friendly, menu driven software which allows the user to do the following major functions –

i) Defining one or more data base.

ii) Searching, displaying and printing search results.

iii) Data entry, updating etc. facilities.

iv) Printing mailing tables.

v) Provisions for integrating various databases by writing short programs.

Some major commands of dBase are –

1) APPEND	2) BROWSE	3) CANCEL	4) CLEAR
5) CREATE	6) DELETE	7) DIR	7a) DIR/P
7b) DIR/W	8) DISPLAY	9) EDIT	10) ERASE
11) GO TO	12) INDEX	13) INSERT	14) LIST
15)MODIFY STRUCTURE		16) PACK	17) QUIT
18) RECALL	19) RENAME	20) SET	21) USE

C) **CDS/ISIS :-** It is a menu-driven generalized Information Storage and Retrieval system, designed specifically for computerised management of structured non-numerical databases. It has been designed and developed by UNESCO's

Division of Software Development and Applications Office of Information Programs and Services. National distributors of this software in India are NISSAT who are distributing it free of cost to the interested libraries. It is a Mini/Micro Computerised Documentation system that can handle any alphanumeric data of fixed or variable lengths. The file structure permits the users to add, modify and delete the records, gain access to master file via any element in the corresponding database, build index from any keywords and to create a variety of print formats like reports, catalogues, index etc. The package also supports ISO standard format to facilitate exchange of information among different systems. The software is highly useful and fast in creating bibliographical data bases for Information Storage and Retrieval. But, the menus provided in the software are not sufficient for house keeping operations and other services such as acquisition and circulation. However, the software allows creation of additional menus and writing programmes for all these activities through PASCAL turbo language. Its version 2-3 is a single use and version 3.0 facilitates multi-users access and provides additional provision for statistical data processing. DESIDOC have successfully modified the programs and new package, based on CDS/ISIS, under the name SANJAY has been developed.

Features of CDS/ISIS :-

a) The system allows its users to create non-numerical data-bases (i.e. data-bases whose major constituent is text).

b) Database can contain over 1,60,000,000 records.

c) Maximum size of display format is of 4,000 characters.

d) Menus and submenus provide options that may be chosen by the user to start work on any other item enumerated in menus and submenus.

e) It allows a user to create his/her own data base.

f) Allows the user to enter new records in a database and edit, modify, delete, print, display or browse the existing records.

g) Status information is displayed as soon as a data-base is selected.

h) Its indexing capabilities are extremely dependable and fast.

i) Its search facilities are simple, accurate and rapid.

j) Details of search results can be seen immediately on VDU and also can be printed or copied.

k) It allows the users to make their own menus or submenus and their own programmes through advance programming.

D) **SUPER DOC :-** It was developed by Thermodata Group in Grenoble (France). It is a user friendly file management and information retrieval package which possesses sufficient flexibility to serve for many applications in library and documentation centres. It can produce index, catalogue, bibliographies etc. This package can be used in an IBM compatible micro computer having an ANSI monitor controller.

E) **IV + V System :-** This system was developed by the Institute for Machine Documentation, Gray (Austria). It is conceived as a generalised DBMS intended for both bibliographic and factual information management. It is designed as an implementation of the relational database model. Basic system functions are; data entry / data editing, database creation and maintenance, retrieval and output. All DBMS and utility software in this system are written in UCSD Pascal. This system functions only in single user mode and is available for use on IBM PC-XT, IBM PC-AT, Wang PC and DEC Rainbow micro computers as well as the DEC PDP – II series using the single user operating system RT 11.

F) **SCI – MATE :-** It was developed by Institute for Scientific Information, Philadelphia (USA). It is a software for micro computers designed specifically

for menu-driven searching of a wide variety of on-line databases and for the management of textual information. SCI-MATE's menu-driven command system guides the user through searches on DIALOG, ISI, BRS, SDC and MEDLINE databases, making the search process simpler while retaining the original search capabilities of the host system. With the SCI-MATE Personal Data Manager the user can create his/her own databases. The database can contain any kind of textual information entered from the keyboard or can include bits retrieval on-line with the universal on-line searcher and transfer that data automatically to the Personal Data Manager.

G) **CAIRS :-** Computer Assisted Information/Library Retrieval System (CAIRS) was developed in 1972 by Leather head Food Research Association, Surrey (UK). The CAIRS runs on mainframes, minis, micros providing a total automated system of information retrieval and management. The software is appropriate for entry, indexing, storage and retrieval of text or numerical data. The system permits four different methods of data entry. They are direct on-line entry, batch data entry, document data preparation, and data prepared using external systems, word processors or other computer or key-disk systems.

H) **INMAGIC :-** It was developed by Warner Edison Associates. It is a flexible data base design tool to organise information effectively and retrieve it quickly. Version for minicomputers became available in 1980 and for micro computers in 1984. Since then it has become very popular because of its range of applications which is due to the flexibility of defining data structure, the flexible report generator and the range of indexing options it provides.

I) **MINISIS :-** It is a generalised information management system applicable to libraries. In 1976 International Development Research Centre (IDRC) began work on the development of a low-cost minicomputer based package that could

be used for its own in-house needs and could also be made available to other institutions and would be flexible enough for use by industry. MINISIS become operational in 1978 and has since proved both its cost-effectiveness and adaptability. It does not require large mainframe computer. It is now an established member of the family of ISIS compatible systems.

Functional features of MINISIS are :

a) It is an information management package applicable to Libraries and Documentation Centres.

b) It does involve programming in the following Information storage and Retrieval operations done on data/records/files :

(i) Enter	(ii) Store	(iii) Check	(iv) Change
(v) Update	(vi) Transfer	(vii) Delete	(viii) Index
ix) Query/Retrieve	(x) Compute	(xi) Print	

c) It has standardised data.

d) It has no redundancy of data stored.

e) Has no in consistency of data stored.

f) Has provisions for optimally utilizing computer resources such as memory.

g) Supports multi-users of various levels of sophistication.

h) Interacts with the users through simple statements/commands and hence easy to operate.

i) Facilitates fast accessing of information.

j) Has the capability of queering synonymous/similar/related data items.

k) Has the capability of retrieving a data by knowing only a part of the data.

l) Performs mathematical operations within/across records.

m) Has capability to print reports at various stages such as 'entry', 'modify', 'post-index', and compute etc.

n) Generates reports periodically on various aspects.

o) Is flexible enough to get linked to MINISIS user-written programs for house keeping purposes.

p) Allows batch mode operations.

q) Provides access to information stored in various languages such as Spanish, French, Arabic, Thai etc.

r) Helps sharing or distribution of information with many leading National/International Information Centres.

s) Can be used to prepare Computer Output Microfiche.

t) Has a full range of utilities to assist the database administrator in creating and maintaining databases.

J) **SANJAY :-** The software package can be said to as modified and extended form of CDS/ISIS. It has been developed by DESIDOC. Since CDS/ISIS lacks programmes for house keeping activities and programme for each of these activities have to be created in it and integrated by Pascal Programmes which is not possible for all Library professionals so in SANJAY through 25 Pascal programmes facilities for house keeping jobs have been provided. Details of this programme can be had from NISSAT.

K) **MAITREY 1** – This software has been developed by Computer Maintenance Corporation of India (CMC) for CALIBNET. This provides facilities for all jobs relating to house keeping and services. This software may be bought from CMC, Calcutta.

L) **WYLYSYS :-** Wipro Library system has been developed by WIPRO Computers Ltd. It has facilities for library housekeeping and services.

M) **DELMS :-** Defence Library Management System has been developed by DESIDOC for use in its library and libraries of DRDO. It has facilities for all library housekeeping and services. It can be had free of charge from DESIDOC by any institution.

N) **LIBSYS :-** Developed by Info-Tech consultants New Delhi. It is a useful menu driven package for use in libraries.

The software selected by the libraries should be flexible, easy to learn and operate and compatible on the network applications. CDS/ISIS is a versatile and user friendly software. It is used by maximum number of libraries. CDS/ISIS is flexible and efficient for having textual information, but compilation of status report and duplicate checking is not possible. This package is economical and is internationally accepted for use in Library and Information work. The use of in house developed software is preferred by several libraries for the reason that it is their own need-based package and is more comfortable than others. Also it enables the utilization of resources within the institution and the system can be modified according to needs. The in-house packages are based on some programming languages like COBOL, C, BASIC, PASCAL etc. and on some readymade packages such as CDS/ISIS, TULIP, WordStar, dBase III and IV, LOTUS 1,2,3 etc. Some commercial readymade packages such as LIBSYS, SANJAY, SLIM, MINISIS are also being used by the libraries. LIBSYS is user friendly and simple to operate.

Out of a total number of more than 2000 Library Application Software packages available World wide approximately 200 are being used in India. Besides the software packages listed in preceding paragraphs the libraries may choose one out of HEADLINE, SWIFT, UNDERLINK, CORTEX etc.

4.13 Humanware :

For effective and efficient services of libraries and information centres computer is only an extension of the human brain's function of data processing and its manipulation by a specially designed machine. Therefore human beings form the most important component of a computer system. The man-machine interface is so vital that human component of the computer system is termed a 'Humanware'. In a conventional library, it is the skills, talent, devotion to work and enthusiasm of the staff which brings perfection to library services and a good reputation to the organisation. Similarly, it is the skills of human beings, associated with a reliable computer system, which go to make for a successful computer-based Library and Information system. It can be said that the first and most important requirement for computerising library and information services is the availability of qualified and experienced staff. Not only for operating the system but also during the stages of actively specifying, designing, programming, testing and installing a computer based system, senior experienced staff are clearly needed.

Team for Computerisation :- Having realized the importance of skilled staff for computerisation the next consideration is that what should be the qualification and experience of the staff how is to apply Computer and Telecommunication Technology in Library. Infact, such staff should possess the professional knowledge of Library and Information activities as well as the technical knowledge of computer and its implications. The staff ought to have experience in operating computer system.

Since most of the Indian libraries are still in their cradle stage of computerisation, the experienced and senior staff holding responsible position in them are though masters of library and Information techniques and possess experience of practical problems but do not have adequate knowledge of computer technology. it is,

therefore, advised that the team responsible for computerisation should have a combination of both, library professionals and computer professionals. The library professionals must be able to act as a means of communication between the library staff and computer professionals who design the system, write and test the programmes. The computer professionals should be skilled and experienced in system analysis and design as well as in operating procedures and programming.

A computerised Library and Information System in its humanware has to include the following personnel –

a) Subject experts

b) Software engineer

c) Library and Information Science experts.

d) Hardware / maintenance engineers.

e) System analysts.

f) Programmers

g) Computer technicians/operators.

h) Data entry operators.

Humanware Development :- All the categories of humanware, listed above, are not needed continuously. Some of them are needed only at the stages of installation or initial organisation and development only. For efficient Library and Information system the Library staff should be given excellent education and training in the application of computers. For this purpose, while on the one hand the posts for such staff may be created who are skilled in both the disciplines i.e. Library an Information Science and Computer Science, and on the other hand the existing library staff must be trained in computer operation by deputing them for short term courses or refresher courses etc. in this discipline. The syllabi of B.Lib. I.Sc. and M.Lib. I.Sc. have to be restructured to include within them computer and

communication technologies, Information Management, Information Technology etc.

Human ware : *Categories and Qualifications*

Designation	Qualifications
Librarian Gr. III for data entry	M.Lib. I.Sc. with one year experience in computer applications.
Librarian Gr. II for supervising the section	M.L. I.Sc. with 5 years experience in computer applications to library services.
Librarian Gr. I Head of College/Research Inst.	M.L.ISc and M.C.A. or P.G.D.C.A. or 10 yrs. Experience in managing computerised information system.
Chief Librarian Universities/Institutes deemed to be university.	M.L.I.S.C., M.C.A. or P.G.D.C.A., Doctorate or published work of high standard an 10 yrs. Experience in managing computerised library systems.

Quality of Humanware :- Human aspects are all pervasive and play a vital role at all stages of computerised system's development and operation. So investment in human resource development is to be regarded as the most significant element in computerised Library and Information Systems. In this fast changing environment the Library and Information workers are required to possess enhanced managerial, professional and technical skills, adequate knowledge and right kind of experience. The humanware should be so competent and trained as they can anticipate changes and respond to them, seize opportunities at the right time and

take initiative whenever necessary. They must possess flexibility of attitude, imagination and scientific bend of mind.

4.2 System Study of Available at I.I.T. Libraries

An attempt is being made here to study the system details of the Libraries of Indian Institutes of Technology, putting emphasis on the Hardware available, Software developed/applied and the Humanware engaged in computerisation and its operation.

4.2.1. Hardware :- The particulars of Hardware available with central library of each of the Indian Institute of Technology are described below one by one –

IIT, Kanpur Library has Compaq Pro. having speed 200 MHz, memory 32 MB RAM, HDD 2.1 GB, SV.GA colour monitor, 2 serial one parallel port, one floppy Drive, one CD-Drive and Ethernet card; DEC 3000/600 having speed 175 MHz, memory 64 MB RAM, Disk space 4.5 GB, DAT Drive, CD-ROM Drive, and Ethernet card; L-Pentium Total – 2TVP = 6(432 MB RAM & 216 MB RAM) having 32 Bit PCI Ethernate interface with UTP & BNC Port, 2" x CD – ROM Drive, 14" non Interlaced colour monitor, PC with Pentium 166 Mtz atleast 4 PCIH 3 ISA Slots, 256 KB Cache 1 GB DD, 1.44 MB Fdd., PCI VGA Adapter with 1 MBD RAM MS Mouse, 104 Kbd, 200 watt MPS; and HCL Pentium 5 having 16 Bit ISA Ethernet interface with UTP and BNC ports, PC Pentium II 200 Mtz MMZE atleast 3 PCI + 256 KB Cache 16 MB RAM 2.1 GB HDD, 1.44 MB fdd, 14" colour monitor PCI VGA adapter with 2 MB V RAM, 1 Parallel port 104 kbd 200 W SMPS mouse.

Compaq Prollant – 2500 pentium pro server 200 MHZ 256 KB High Speed 4 way set associate cache 32 Bit RAM, 2.1 GB Fast Wide SCSI-Z Hard Disk Quad speed

CD-ROM, 1.44 MB fdd, Integrated network Card, 14" SVGA Colour monitor, 2 serial and a parallel port compaq insight manager smart start is one in number.

Zenith (4 numbers) with 5.25" 1.2 MB fdd, 16 MB RAM, 8 X CD-ROM, 14" 028 MM DP or better Non Interlaced colour monitor, PC with Pentium 100 Mtz atleast 3 PCI and 2 ISA Slots, 1.44 MB fdd, mouse.

Zenith (1 number) Pentium @ 100 Mtz, 16 MB RAM, 256 KB Cache, 1.2 GB HDD, 8 X CD – ROM, 1.44 MB fdd, 14" Mono Monitor, Mouse, Kbd.

Zenith (1 number – micro monitor, 1.44 MB, 3 ½" fdd, 40 MB HDD, 1 CD-ROM. (486 Configuration). Wipro (386 Configuration) (2 PC) 1.2 MB fdd, 40 MB HDD, 1 MB RAM, 2 CD-ROM, Keyboard. Zenith (386 Configuration) (2 PC) 1.2 MB 5" fdd and 1.44 MB" 3" fdd, 40 MB HDD, 1 MB RAM, Mono Monitor, 101 Kbd.

Terminals :-

SMA 100 –

> Not working ………….. 14
> Working ………………. 07

HCT 1100 –

> Working – 05

CC –

> Not working – 01

PC X T

> HCL –

Not Working (3)

SHYAM – Not working (3)

SHYAM – Working (2)

PC – 386

Wipro – Not working (1)

Wipro – Working (1)

Zenith – Working (2)

Upgraded – Working (1)

PC – 486

Zenith – Working (1)

Pentium

Zenith – Working (5)

HCL – HP – Working (13)

DEC – Alpha – Working (1)

Compaq – Working (1)

Printers

L & T   – 7

L X 86   – 3

DL 3400   – 1

EPSON LQ 100- 2

LASER   - 2

Wipro LQ 1050 – 4

Inkjet 670 C - 1

IIT, Delhi Library has 5 IBM, 1 Compaq, 5 Assembled and 5 PCL – 5 Computers. The specifications are 32 – bit, 266 MHz, 4.0 GB. This library has total 30 terminals, 2 terminal controllers, 37 PCS (Pentium, Pentium II and Pentium III) and 4 servers spread over 3 floors of the library. The library has its own sub-LAN which in turn is connected to the campus LAN. All 30 terminals, 37 PCs and 4 servers are connected to the Campus LAN.

PRINTERS

HP Laserjet (42)

IIT, Madras (Chennai) Library has 1 mainframe (specification not provided) with 24 terminals and 20 PCs.

Printers.

Laser and Dot Matrix printers total 18 in number (Details not provided).

IIT, Bombay (Mumbai) Library has Maxman, Pentium mainframe computer systems and 22 terminals. It also has 17 PCs 386 having 40 MHz and 4 MB RAM. Input is through keyboard, floppies, CDs and downloading databases.

Printers

132 columns Laser printers – 8

80 columns Laser printers – 2   Total 10 Laser printers.

The speed of printers is 6 pages per minute and 600 d.p.s. respectively.

IIT, Kharagpur Library has HCL-HP, PCL, Meteer – III and HCL – Infiniti. It has 16 Unix terminals and 12 PCs. Meteer – III has SCO Unix 4.32 of 16 bits and Pentium Pro has SCO Unix 5.02 of 32 bits. The speed of processing is 50 MHz and 166 MHz. The memory is 16 MB RAM, 150 MB HDD, 128 MB RAM, 12 GB HDD. The input/output devices are 5.0" and 3.5" FDD, Mag. Tape (150 MB), and 5.25" and 3.5" FDD Mag. Disc, CD-ROM drive and 5 VGA.

Printers

5.1 L & T scribe 36 Dot Metrix (06 nos.)
HP Laser Jet .5 Si (01 no.)

The Library of IIT, Guwahati has IBM, HCL and Compaq computers. These are personal computers and the library has 13 terminals. The internal memory is 3.21 GB and 4.1 GB. The input/output devices are keyboard, floppies, CD-Drives, printer etc. It has one laser printer and one Barcode printer. The library being small in size and comparatively new has a smaller set up of hardware. But it is reported to be sufficient for their present requirements.

The library of IIT, Roorkee has 01 Pentium III server with 800 mhz CPU speed, 256 MB RAM, Hard Disk capacity 20 GB, CD-ROM capacity of 52X and Ethernet card 10/100 mbps; 01 Pentium II server of CPU speed 300 mhz, 64 MB RAM, Hard Disk capacity of 4 GB, CD – ROM capacity of 32X and Ethernet card 10/100 mbps; 01 Pentium MMX server of CPU speed 200 mhz, 64 MB RAM, Hard Disk capacity of 4 GB, CD-ROM capacity of 32X and Ethernet card 10/100 mbps; and 02 CD-ROM servers each with 14 CD tower 32x X 40x and Ethernet

card 10/100 mbps. The library has in all 16 nodes i.e. 03 Pentium III of CPU speed 550/850 mhz, 64/128 MB RAM, 8 GB/20 GB Hard Disk capacity, CD-ROM capacity of 52X and Ethernet card 10/100 mbps; 02 Pentium II of CPU speed 200/366 mhz, 32 MB RAM, 2 GB Hard Disk capacity, CD-ROM capacity of 40X and Ethernet card 10/100 mbps; 10 Pentium MMX of CPU speeds 100/133/166 mhz, 16/32 MB RAM, 2 GB Hard Disk capacity, CD-ROM capacity of 24X and Ethernet card 10/100 mbps; and 01 Pentium of CPU speed 33 mhz, 8 MB RAM, 1 GB Hard Disk capacity and CD-ROM capacity of 8X. This library has 6 dot matrix printers of 132 columns and 3 laser printers. For networking it uses CAT cables and one switch 4 networking hub. It has 2 barcode scanners and one A3 scanner bed. 02 CD writers, 03 UPS of 1 KVA each and 02 CD Exchanger each with 6 CD are the other hardwares available in the library.

4.2.2 Software :

The Libraries of different Indian Institutes of Technology have followed varied practices in using the software. Some of them gone to develop their domestic software for most of their computerization and for a few bought readymade packages e.g. Libraries of IIT, Kanpur, Mumbai, Delhi and Chennai, while on the other hand Library of IIT, Kharagpur used LIBSYS. However, the particulars of Software, as reported by the Libraries individually, are as follows –

IIT, Kanpur Library developed a fully integrated Library Automation Package under the name iit-KLAS for coputerizing the various functions of the library. It is a user – friendly solution offering complete functionality. The day-to-day tasks performed in the library are much easier to accomplish with iit-KLAS, thereby increasing the overall efficiency of the library. The iit-KLAS has been designed and developed locally by a team of library professionals from Central library and software professionals from Department of computer Science and Engineering.

The main objective has been to make the system simple to operate and yet offer comprehensive functionality. The understanding of human and organizational realities has been a central factor in its conception. The package has been developed on ORACLE RDBS version 7.0 This means that iit-KLAS is not tied to any computer make or model but can run on a range of host computers from desktop micros to mainframes. By using an RDBMS iit-KLAS gets the advantage of Vigorous database features such as concurrency, recovery and transaction rollback capabilities which ensure the integrity of the database. It is easy to extend and incorporate new features and capabilities.

Iit-KLAS offers simplicity of use with forms-based user-friendly interfaces and the operators requires negligible training. It is entirely menu-driven with well-planned and designed screens providing meaningful on-line messages. This software has been in use at IIT, Kanpur for over 7 years and has a proven track record of performance and reliability in responding to the rigorous demands of the users as well offering extensive configurability. It permits the library to associate special authorization levels appropriate to each user's responsibilities. Individualized passwords on the login screen prevents unauthorized access. This gives important control for governing usage and protects the integrity of the database. The various modules of iit-KLAS are described, in brief as under –

a) **LEKHYA** – The Acquisition module handles the acquisition of all accessioned items. Its functions include ordering and budget control. Some of its features are :

Pre – order searching with access to catalogue search.

Entry of indents.
Generation and printing of purchase orders.

Cancellation/confirmation of purchase orders.

Claiming facilities for overdue orders.

Foreign currency conversion.

Vendor records management.

Receiving and Accessioning.

Invoice processing.

Multi-department budget control

Instant update of budgetary commitments and expenditures.

Fiscal year set-up.

Several access points-by title, author, indent number, purchase order number, department, requester and publisher.

Requester Arrival Notices.

Indent status accessible to requesters through Academic Information centre.

b) **SUCHI** – The cataloguing module supports the Technical Processing function of the Library. It is used to build and maintain the database used by all other modules. Bibliographic data is entered only once. The features of 'SUCHI' include :

Records creation for books, reference material, text books, thesis, technical reports etc.

Easy data entry without requiring extensive knowledge of cataloguing.

Only fields for which data exists need be filled.

Validation of fields.

Display of catalogue cards on-screen for verification before printing.

Printing of catalogue cards for Shelf – List, Title and all added entries.

Catalogue cards printed individually or in batch mode.

Generation of list of new additions, and author/subject/title indices.

Generation of new arrival listing.

C) **CIRCULATION** – This module of iit-KLAS has been designed to ease the load of heavy issue/return transactions by fast response times. This program implements the circulation policies more effectively. Its features are :

Easy issue and re – issue

Rapid member registration and clearance.

Retrieval of member by member ID for all transactions. Verification of member status prior to all transactions. Automatic due date calculation by member/item type. Automatic fine calculation and posting.

Special issue.

Reduction of issue duration for items on reservations.

Reservations by title or copy.

Multiple member categories.

Configurable circulation policies (Parameters include duration of issue, issue limit by member category, fine rate etc.).

Lost items management.

Off – Line circulation.

Sophisticated security featuring privileged access to system options.

Transaction logging.

Statistics.

Overdue, fine notices, reservation slips.

Reports (items issued/returned, member overdue activity etc.).

Selective purging of fines.

Holiday list management.

c) **PATRIKA** – Serials control module automates the task of managing journals' subscriptions. It supports the following features.

Subscriptions :

Ordering and renewal of journals by supplier or individually. Adding, editing, Cancelling subscriptions. Package subscriptions.

Invoice processing featuring automatic update of budgetory commitment/expenditure.

Invoice Reminders.

Form A2 / Payment/Refund processing.

Supplier database management.

Receiving :

Receiving of individual issues of any subscription year.

Automatic generation of missing issues.

Claim processing :

Identification of expected issues and subscriptions for which supply has not begun.

Printing of claim letters by supplier.

On-line queries of claimed/unclaimed issues.

On-line queries :

Subscription details.

Received issues.

Subscriptions pending invoicing/payments.

Paid journals by department.

Reports :

Journal listing by supplier, department

Payment status by department.

List of active subscriptions.

d) AIC – The on-line Academic Information Centre is fully integrated with all the other modules of iit-KLAS. It is the window through which members search and view information generated by other modules. AIC features user services such as :

On-line catalogue search :

Item availability status updated in real time. Search by author, title, call number and accession number.

Context – sensitive help screens.

Shows availability status for all copies.

Browsing of search results in three levels of detail.

'Current contents' search : Latest 20 issues of 'Current Contents' available for three different disciplines.

Searching by journal name, subject and keywords. Search results displayed in Table of contents format.

Detailed information for each article available on touch of a key.

New Arrival : Displays list of books and CD-ROM based databases that have been received in the last week.

Information displayed for CD-ROM based databases includes description and the period covered.

Journal Subscriptions :

Searches by journal name and/or department.

Displays the location and the latest issue received.

Circulation Queries :

Allows members to review their fines, issues and reservations.

Lists non-accessioned items on loan.

Direct access to item availability by accession number.

'Current Contents' Profile Entry :

Members provide their search profile comprising of maximum ten queries.

Each query consists of discipline, journal name and keywords.

Journals listing provided for each discipline for selection of journal name.

Wild card searching facility for keywords.

Search results sent by electronic mail to members.

Search profile including e-mail addresses saved. Profiles run on latest ' Current Contents' issue received.

Book Indent Queries :

Allows requesters to view indent status-indent received, ordered, item received etc.

Search the indent database by title author, requester, department, publisher etc. Displays date of order, date of accessioning and other details.

The continuous enhancement and day-to-day operations of iit-KLAS is being taken care by a full-fledged Library Automation Division of the central library. This division comprises of computer professionals and library science professionals, trained in the area of information systems. In addition to the services mentioned above, the Library offers computer-Aided-Reference-Services (CARS) which provides over 20 different CD-ROM based databases such as Match Sci disc, compendex plus, SocioFile, Psych Lit and Comparch. The library provides monthly Current Awareness Services (CAS) in Mathematics, Psychology, Sociology, Management, Chemical Engineering, Mechanical Engg, Civil Engg., Computer Science and Electrical and Electronics Engg. Currently iit-KLAS is running on a DEC Alpha 3000/600. The system is having 25 terminals distributed throughout and connected by LAN.

IIT, Delhi Library initially developed a software locally under the name LIS in C++ language for their house-keeping routines and In-house databases were developed using micro CDS/ISIS package of UNESCO. In 1998, the LIBSYS package – a commercial package was bought and has been fully implemented for computerization of all the in-house activities in the Library, mainly Acquisition, circulation, cataloguing and serial control. The data entry of current serials is in progress. The system administration of different interfaces of Library Computerization and regular updating of OPAC and Library Home Page is done by Computer Application Division of Library. The library is developing web-based Digitized collection for distant and continuing Education in Information Technology. A Demonstrative Project on Internet-based online Interactive courseware was funded by the Ministry of Information Technology. The online Directory of Courseware is already available on the Internet and is being updated

regularly. The of development and maintenance of Institute's Web Page funded by IRD, IIT, Delhi has been implemented.

The in house databases which had been developed by the library using micro CDS/ISIS have been recently been ported to Java ISIS Interface so as to facilitate simultaneous access to the users on Internet and Intranet. These databaes are –

Database of Serials in Central Library.

Database of Text book collection.

Database of Book Bank Collection available in the Central Library.

Database of Ph.D. Thesis submitted to the IIT, Delhi.

The Library Home Page is an integrated interface for all computer and web-based services available in Central Library. The interface available at the Library Internet server offers the following information/services-

Guide to the Central Library.

Collections and Library Services.

Library Layouts and Floor plans.

Library Hours and Membership.

Computerization Programme.

Network connections.

Web-based Library OPAC.

Web-based online journals' Kardex.

TELNET to DELNET Databases.

Link to CDNET System on Campus LAN.

Recent Additions to the Book collections.

Web-based access to full-text e-journals.

Link to collection Digitized in-house.

Web interface to database-serial, Text books, Book Bank, and theses etc. developed in-house.

In addition to more than 800 titles of current journals (Print form) and above 90,000 bound volumes of the journals, about 1400 electronic journals can also be accessed full-text through the following main e-publishers' sites-

Science direct (Elsevier Science)

American Physical Society

American Institute of Physics

ACM Digital conference Library.

American Society of Civil Engineers.

Nature Magazine.

IEEE ASPP

The Library offers network-based CD-ROM search services which can be accessed anywhere on campus LAN. For accessing CD-ROM databases available on campus LAN there is a need to configure your internet enabled PC as a client to the window NT server. This server hosts the CD networking software and is hooked to the CD-ROM Tower having multiple number of CD-ROM drives. The detailed procedure for configuration of PC is also available at the Library Home Page. For the members who lack computing facility 15 pentium machines have been installed in the Computer Application Division of the Library to facilitate CD ROM search services from within the Library. These workstations are also used for accessing web-based online electronic journals as well as other electronic resources available on internet. The Library subscribes to the following 12 CD ROM databases –

COMPENDEX plus, 1992 onwards (COMPENDEX plus 1985-1991 available on workstations).

Inspec, 1990 onwards.

METADEX, 1990 onwards.

Derwent Biotechnology Abstracts, 1982 onwards.

World Textile, 1970 onwards.

Business Periodical Index, 1982 onwards.

Math Sci, 1988 onwards.

EXIM – India on CD

LISA plus

Induscope : India's Industry Database

India Business Insight Database, 1993-1999.

Indian Standards on CD ROM

The Online Pubic Access Catalogue (OPAC) of Library is operational both on Internet and Intranet. It can access to search more than 1,30,000 bibliographic records of books, available in the library database through Web-based search interface or with Window clients of the LIBSYS on Intranet. The OPAC facility also provides information about new arrivals of issues of journals/supply status of the current journals in the Library (Kardex record of journals for the year 2001). The web-based OPAC can be accessed through the Institute's Home Page. It can also be accessed through the Library's Home Page.

The Library is having a video library equipped with four VCP and Video Display Units. It has a collection of more than one thousand Video cassettes. The library uses bar-code technology for computerized circulation system. Every book in the Library bear a bar-code tag that is used for its circulation. Similarly, all categories

of users have bar coded Patron cards. The library has developed in-house facility for bar-coding of books and Patron cards.

The LIBSYS software is being installed on WINDOWS NT Server. The salient features of this package, for each of the library activities, are summarised as follows –

Acquisition : Maximum 3 reviewers can be given. While in procurement or the update title screen the 'Recommend' button can be activated to specify the reviewers' names. They are reflected in reports.

The system provides options for serial numbers continuous just by specifying yes/no, e.g. if marked y and proceed with approval process by including say 12 titles in an approval number and say another 7 titles in the subsequent number. Now if these two approval forms are generated the first one would contain the titles serially arranged from numbers 1-12 and next one would start the number from 13-19. On negating this option the form can have the numbers 1-7. On checking the setup in the existing field '20' would be displayed which reflects that the next approval form generated would start with serial no. 20. By typing a number say 25 the form can start from this fresh number.

Duplicate check is done irrespective of the type of document selected. The title field can contain the first few words of the title and if those first-words exist in any of the titles, all of them and if those first words exist in any of the titles, all of them would be listed. System scans the bibliographic database to check if the title already exists. Besides catalogued titles, other titles which are in different stages of acquisition are also scanned during the check. The screen displays all the titles which match with the few words which have been typed in the title field. At the bottom of the screen the following options can be seen –

New Title Edit select Acq-Dtls Dtls Quit Please Increase space on dots If the title entered in the title field is to be treated as a fresh title 'New' button can be clicked. A new entry is initiated and the bibliographic screen appears. This title can have a duplicate or no duplicate. 'Edit' option is exercised when a title already existing but with a different edition is to be entered. To enter a fresh edition of title already existing, select/highlight the title first and then click the edit button. This results in copying all the bibliographic details of the selected title to create a new bibliographic record and then allows changes to be made in the respective fields for the new edition. Under this option, a new title entry is initiated in the database. 'Select' option enables the selection of an existing entry and ordering for additional copies. After selecting the title on clicking 'Select' option the procurement worksheet opens. The bibliographic data remains the same. By clicking 'Acquisition Details' option, if a title is active in acquisition, its procurement details such as order, date etc. can be seen. Before selecting any of the options given, there is a facility to see the catalogue card of the title selected from the list by highlighting the title and clicking on 'Details' option. If the card continues in two screens then there is one option to view the previous card and continuation on next card. In order to view the details of the next title 'Nxt Ttl' option is used. 'Cps' is used to view the copies of the title on screen. Members of the Library can make a request for acquisition of new titles from OPAC. LIBSYS provides an interface to transfer such requests to the Acquisition system. Bibliographic data may also be loaded directly into the Acquisition System by the 'Data Import' facility provided by LIBSYS. Data is down loaded from CD-ROMs or on-line bibliographic databases both in MARC and non-MARC formats. In case the details of books are to be downloaded from the internet then 'Networking Downloading' option is used. The ISBN of the books, whose details are to be downloaded, and the name of the server, where the book details reside has to be given. The server, being accessed, should give the download facility to the users.

Vendors' data, available in a format which can be converted into text formate, can be easily imported into LIBSYS. The text file must be copied into the workfile path before the import. The file name or Input file and any name in the Record structure file field has to be mentioned. Record structure has to be defined. The size of each field to be imported and also the field sequence has to be given. The total of all the field-size + 1 would be typed in record size field. The order form has an option of sending it directly to the vendor through e-mail if the address is specified while entering the vendor's details and checked the use e-mail.

Cataloguing :

LIBSYS supports different bibliographic formats for various types of documents. Some of these are : Books; Conference proceedings; serial books; Reports; Standards; Charts/Maps; Micro documents; Theses; Patents; Manuscripts; Articles; Preprints; Reprints; Photographs; Photocopies; Films; Videotapes; Audio-tapes; CDs. 'Globan Changes' function facilitates replacement of a word or phrase in any field of a type of Document throughout the database. The change would occur in the entire database.

If replacement is to be done in all fields then check this field or else select the codes of the fields in which changes have to be made. The existing text and the text by which replacement has to be done are to be typed.

The types of documents being created in LIBSYS will automatically get listed alongwith their description and format Ids (Identifications). Valid levels, for the purpose of maintaining confidentiality of documents, can be defined and can be associated with each title. If the types of documents defined are to be treated as separate databases for the retrieval (OPAC) purpose then they must be named. Maximum of 9 databases can be created. Each database can have different

catalogue names which can be set. After defining the types of documents, for each predefined bibliographical format provided by LIBSYS, following should be specified:

Searchable fields in Boolean Searches (With option to index the full field or words in the field).

Author Index

Fields to be indexed (tags/codes).

Fields to be displayed in the brief list of Author catalogue (tags/codes).

Title Index

Fields to be indexed (tags/codes)

Fields to be displayed in the brief list of Title catalogue (tags/codes).

Classified Index

Is it to be implemented ?

Fields to be displayed in the brief list of classified catalogue (tags/codes).

Subject Index

Is it to be implemented ?

Fields to be displayed in the brief list of Titles of a Subject catalogue (tags/coes).

Keywords Index (of all the searchable fields)

Is it to be implemented ?

Fields is to be displayed in the brief list of the Search results (tags/codes).

Database Number (From '1' to '9' as defined in the Document Formats function).

Fixed attributes to be included in card display ?

Define following fields (by indicating corresponding tag/code).

Year of publication.

Series.

Notes.

ISBN.

Class Number.

Place.

Publisher.

On selection of this function, the system displays the various format Ids. The cursor is to be brought against the format for which the above parameters are to be changed before pressing 'Enter'. On selection of a specific format. ID, the system displays the existing values of the above parameters and accepts changes in the same. At this stage, the description of various fields can be seen by pressing codes description. On pressing this following additional parameters can be specified -

Default card format (A = AACR-2; M = Mnemonic based; U = User defined).

Is sub-title field present ? (Y/N), on entering required changes in the parameters, press enter to update the database.

'Set Database Access' function is used to define access to different databases for different categories of the members of the Library whose records are maintained in

the 'Circulation' system. For the purpose of sorting the title indices, words that have to be ignored should be defined through parameters 'Define Articles'. They are defaulted to 'A', 'AN' and 'THE'. Stopwords other than these can be defined here.

'Accented Characters' value should be defined alongwith the normal value of the alphabet so that when the ASCII file is sorted for indexing, the entries may appear together. For Current Awareness Services the documents acquired through the Acquisition System are tagged automatically at the time of cataloguing to a 'New Additions' File. The entries created directly through the Cataloguing System, may also be tagged automatically to the same file. The 'New Additions' entries can either be browsed in OPAC or can be used for monthly, quarterly or any periodic generation of a list of 'New Additions' to the Library. The entries in the list can be arranged in any one of the following orders :

Subject heading or keyword

Classified by code and subject.

Alphabetical.

Following functions are available for maintaining the 'New Additions' file :

List New Additions

Update New Additions List

New Additions Check List

New Additions List

Develop File

Bibliography

Remove file

Special bibliographies can be generated by accessing various on-line catalogues. The list may be arranged in any of the following orders :

Subject heading or keyword

Classification number with corresponding subject.

Alphabetical arrangement by author/title.

Circulation :

To set up a circulation system in LIBSYS, members' details like Registration Period, Regn. Expiry Notice Period, Regn. Renewal Period, Address and Name of Member, Group, Subject and Sex of Member, Identity card no. of students and sign of Identity of staff are provided on the worksheet. In the next worksheet parameters of check-out/Renewal like maximum number of documents to be issued to a particular category of member, duration for which a type of document can be issued to a particular category of user, maximum renewals allowed, maximum reservations and category for late fines etc. have to be provided. When there is a set of documents meant for only a cadre of members then the option of 'Special Material Category' can be activated as follows :

In cataloguing a document category say 'S' is being created. For the titles already entered, the holding can be updated and category can be changed to 'S'. For new entries, while accessioning, the category can be specified as 'S'. In circulation a member category say 'Special' is being created and 'Any privilege say Y' is recorded at the time of Registration e.g. the category of member say Scientist or Teaching faculty and additional category as 'special'. Once the check-out is processed the same title with its other details can be transferred into cataloguing module by activating transfer circulation titles option in the House keeping function of circulation.

Every Transaction taking place from the circulation module is recorded as a separate entry and stored in a log file. Transaction log can be generated from enquiries and print-out of the same can be obtained from the reports. In Transaction log file cut-off transaction date and time has to be given. A print-out of transaction log can be generated for record purposes.

Serial Control :

The worksheet/screen would require inputs like Title, Name of Publisher with address, Subscription amount, Delivery mode, Volume and Issue details, copies, Name and Address of Vendor, if any, Budget head, Date of receiving Ist issue, Expeced date of next issue etc. Unless any one of the following options is chosen, Kardex can not be done. The table below describes the kind of control a journal comes with and the corresponding options to be used –

Journal	Options to be used
Volume No. only	Vol.
Issue No. only	Issue
Volume No. and Issue No. both	Vol. Issue
No Volume and Issue Nos. only period	Period
Issue No. and Year	ISS-Yr.

In case the journal's subscription begins from April and ends in March the field 'Vol.' Overlap with pervious year' has to be checked (set as 'Y'). In case of packet subscription where 4-5 or more journals are being received as one set from a vendor then set no. can be specified. If two journals, e.g. Computer Today and PC Quest are being procured a set from CAN then the details of Computer Today are entered and set no. 1 is given to this. Again from PC Quest details are entered

and set no. 1 is given to that also. These both will be invoiced together with a set price. There is a provision to enter upto 9 sets from a single vendor.

S.D.I. :

Selective Dissemination of Information (S.D.I.) is generated taking into consideration of interests of the members. In the Ist step a list of subjects/strategies on which articles are majorly present in the library is being developed. A numeric or an alphanumeric code followed by the description of the subject is given. In the 2nd step the Interest Profile of the Members (Users' Interest Profile) is being created by selecting the codes of subject of his/her interest from the list. The 3rd step can either be started by developing a file with range of records or simply continued and giving the range of Member Identification for whom S.D.I. has to be generated. The necessary details like the output filename, print, view file, range of records, in case file is not established, are being filed up.

The Library of IIT, Madras (Chennai) developed in house software and used ISQL and ORACLE. ISQL based on UNIX operating systems has been used for house-keeping routines like Acquisition, circulation, cataloguing and serial control Systems. Recently the Library has started using ORACLE for its computerization activities. For circulation system bar-code technology is being introduced. The Library has OPAC which is accessible in the whole campus of the Institute through LAN and Intranet. The Library is having Internet facility and all users, including students, can make use of it. The library provides CD-ROM Service and has 56 drives for CD net. It provides on-line services to its users. The library is reported to have more than one dozen of CD-ROMs. Video Viewing facility is available in the Library and it has more than 300 video cassettes.

The Library of IIT, Mumbai (Bombay) developed their software locally using FOXPRO on novel Nateware Platform. For serial control system efforts were made from 1982 to 1986 by Dr. (Mrs.) Date of Computer Sciences and Mrs. V.S. Subbarao, Head Periodical Section of Central Library to develop a software to be used on EC1030, a third generation system, but the results were not satisfactory. Therefore, a readymade software SLIM was installed in 1990 for serial control system. Library developed menu driven softwares PUSTAK AND PURTI. For circulation system Barcode technology is used. Library's databases are available on Internet. The Library's collection can be accessed through OPAC.

OPAC, the gateway to the Central Library resources is accessible 24 hours on Campus LAN. Database covering technical reports, standards and pamphlets is being created and available on LAN. The library has CD-ROM Networking System (CD-NET) with towers of 56 drives. The CD-ROM databases available in the library can be accessed round the clock on campus LAN. Some of the important collections of CD-ROM database are :

INSPEC on disk.

Engineering Index – Compendex – Plus.

Chemical Abstracts Surveyor.

Chemical Abstracts 12th Collective Index.

Dissertation Abstracts on disk.

Index to Scientific & Technical Proceedings (ISTP).

Powder Diffraction Files (PDF).

McGraw-Hill Concise Encyclopaedia of Technology.

Oxford English Dictionary.

Ullman's Encyclopaedia of Industrial Technology-index.

To support the Academic and Research Activities of the Institute and members the following services are provided by the Library under its Reference Service –

"Ref-Alert" informs about the latest reference books acquired by the Library.

Readers are kept informed about the forthcoming National and International Conferences/Seminars.

Library compiles Bibliographies and Documentation Lists on special occasions.

Maintains the data relating to the employment opportunities available for scientists and engineers.

Through Video Viewing facility Educational films can be viewed by the students and staff.

Maintains a collection of booklets and handouts about the courses, scholarships and fellowships available.

Weekly display of books added to the Library. The list of displayed books is available on "MEHMAN".

Articles and the notifications of the books, published by the faculty members, are displayed on the notice board.

"Lest you Miss" service keeps the users alert on the information appearing in the journals, newspapers, reports etc. received in the Library.

List of articles and news items of general interest on Science & Technology, collected from newspapers and journals, are displayed.

E-mail is available in all sections of the Library. E-mail is being used for :

Sending claims for books/journals' issues not received.

Queries regarding publishers' price for journal subscription, books etc.

Queries regarding availability of new books, journals, monographs, conference proceedings etc.

Inter-Library loan

Current information service to faculty based on CCOD.

To inform users about books that have been urgently processed and are ready for issue.

Renewal notices with details of the book- an information service to faculty members.

The Library's almost all the house-keeping routines viz. Book Acquisition, circulation control, serial control, cataloguing and indexing have been fully computerized. Information Storage and Retrieval services, provided by the Library, are CAS, SDI, Reference Services, Retrospective and on-line information services are provided by the Library.

Some important features of the software are as follows –

Book – Acquisition

Acquisition Data file is maintained which keeps a record of books received against Suggestions, books received on approval basis and books received as donations.

File has Bibliographical details like Author, Title, Subject, Imprint, Volumes/parts, collaborators, series etc. Funds allocation file to disclose the allocated amount for each individual deptt./subject. Order file includes all the orders processed. Reminder file to issue reminders for the books not supplied by the Publisher/Vendor.

Vendor's file.

Accession Registers. file

Serial Control :

This software has following files :

Current Periodical file.

Subscription file.

Vendor's file.

Bill file – Payment – Fully/Partial.

Reminder file.

Processing file.

Record file.

Circulation :

The files and modules of circulation control system are as follows –

Users' data file.

Books' data file – Author, Title, Classwise, and keywords.

Issue record file.

Returned books' file.

Overdue books file.

Overdue fine calculation.

Reservation of books.

No Dues checking and keeping record.

Data additions/modifications.

Lost books' process.

Statistical report generation.

Know your Library – Pamphlet.

Library Rules.

Daily breakup of charging/discharging etc.

Status of book.

Number of books issued to users.

Daily transactions – According to Accession number, users, subjectwise, Departmentwise.

Stock verification Data file etc.

PUSTAK :

It is a menu-driven, modular, user friendly PC/AT based system, designed for the use of the circulation function of the Central Library. No prior knowledge of any programming language is assumed on the part of user. However, user has to be reasonably familiar with the PC/AT i.e. how to put it on, how to shut it off, insert a floppy, and how to enter data when presented with a screen form. As part of its housekeeping, menu driven backing up of books, data is provided from Winchester to a 1.2 MB capacity floppies. The following description introduces how to invoke the system; choose a menu, invoke it; choose a submenu, invoke that, and get the desired output. The user should remember, that output from any system is as accurate as the input that goes in i.e. inaccurate input will produce garbage output. Therefore, it is imperative that when in doubt, the user should consult the manual, the programmer, or the associated library staff, before entering data.

To invoke or start the PUSTAK system first put the power on then system ON and then monitor ON, insert the floppy and allow the system to boot. After a very short time 'PUSTAK MAIN MENU" appears on screen. The 'PUSTAK MAIN MENU' allows to do the following –

1- Entry of data.

2- Modification of existing data.

3- Printing of various data.

4- Browsing through data.

5- Processing issues, returns, claims, overdue books, fines etc.

6- Backing up of books data, i.e. the computer catalogue.

7- Quit.

The 'PUSTAK' system defines 3 main types of data, viz. Books Data, Users'/Borrowers' Data and Claims Data. The data is keyed in essentially by the user, as opposed to other data like issue records, overdue books data etc. that is generated by the system from time to time. The data entry is of only the primary data i.e. the books, users and claims. Modification, browsing and printing options of the main menu again pertain to operations on this primary data. Once all primary type data is entered, the users may proceed with issuing books and processing their subsequent returns etc. The users must option 5 for this purpose. All the various operations that can be done are indicated by a number that describes the option. The options 1 to 7 are listed above with their descriptions e.g. 1 for data entry and 3 for printing the data. After choosing the desired option ENTER has to be pressed. This will take the user to the desired sub-menu.

Data Entry Sub-menu : This sub-menu allows data entry of two types of data, viz. Books and Borrowers. For entering the data of books first the Accession number

has to be entered correctly which displays a form. The various fields have to be filled in the following manner –

The title has to be keyed in. Maximum size of this field is 250 characters. Next a maximum of 3 Authors may be specified for a book. For a given author the entry format is : last name, initials. 'ENTER' has to be pressed after each field and also after entering the name of each author. Next the year of Publication has to be keyed in. The Publisher's details have to entered in the format : Publisher's name, place, year. The Collation refers to information about no. of volumes, pagination, size etc. This may be entered in any order. The classification used in IIT, Mumbai Library is Universal Decimal Classification scheme (UDC) and the class no. assigned to the book has to be keyed in. After entering all information on the screen form 'ENTER' has to be pressed. The system now writes all this information on disk and then ask for the next Accession number. After entering all the Accession number option 3 is to be pressed which brings the user back to Pustak Main menu. By pressing option 2 and 'ENTER' the user can again start data entry.

For data entry of user (Borrower) we have to press option 2 of data entry sub menu. The system will prompt to the Borrower's code which is being assigned to every borrower of the Library. By Typing the Borrower's code the screen shows the from which has a user code (6 digit numeric code), Name of the user (upto 30 characters), Name of Department (Upto 5 characters) in standard abbreviated form, category (If the books is to be issued for a period of 30 days enter the number of days in numeral and if till semester enter ϕ as category, number of Books allowed (It is, at maximum, a number of 2 digits e.g. for faculty 15 books which is to be entered as ϕ and for Director/Chairman/Board of Governors where the number is unlimited enter as 99), and at the end cumulative fine which is being

entered automatically by the system as and when a book is returned after the due date.

Modification Sub-menu :- This sub-menu can be invoked by choosing option 2 of PUSTAK main menu. This sub-menu allows to Modify Existing Data. Whenever a change is desired in the data already entered this sub-menu has to be invoked. This sub-menu offers 3 choices viz. For modification of data of books choose 1 of this sub-menu; for modification of data of Borrowers choose 2 of this sub-menu; and for modification of claims data choose 3. To modify the data of book after pressing 1 and ENTER the concerned Accession no. is to be keyed-in. This brings form on screen and we may navigate though the form by bringing cursor to the field where data has to be modified. After modifying the data option 4 of the sub-menu is used to exit from sub-menu and reach to the PUSTAK main menu. For the modification in user's data option 2 of the modification sub-menu has to be selected. The next step is entering the Borrower's code (a six digit numeric code). Now the screen displays form of user's data and by bringing cursor to the field where modification has to be done the desired modifications can be made. By pressing ENTER on the last field the modifications for the particular user's code is completed and the information is transferred on disk. Now the system prompts for another user's code and the same procedure is repeated. If user's code is entered as ZZZZZZ or option 4 is selected the system allows to exit from this modification sub-menu and brings back to PUSTAK main menu.

For modifications in claims data, option 3 of the modification sub-menu has to be selected followed by pressing ENTER. In case of claims the main difference, from other two modifications is that, there may a number of claims on one book. This means that whole claim record for that book has to be looked in to find that in which particular data modifications have to be made. The first query is about the Accession number. On keying-in this data the screen presents the total record of

claimants for that Accession number. Now by bringing cursor to the claimants concerned. The desired modifications can be made. An entry of Accession no. zzzzzz takes us back to the modification sub-menu. By keying -in QUIT the system brings you back to PUSTAK main menu.

Printing of data sub-menu : This sub-menu of 'PUSTAK' may be invoked by selecting option 3 of main menu. This submenu offers 3 choices i.e. "1" for printing the data of book, '2' for printing the data of user, and '3' for printing the data of claims. For printing of book data after selecting option '1' of this sub-menu and then pressing the beginning accession number and the last accession number if a selective print out is desired. And if print out is desired from is beginning the to the end just press 'ENTER' after selecting the option '1'. This will give a complete print out from smallest number to the largest accession number. For printing of Borrower's data select option 2 of this sub-menu and then key-in the Borrower's code and 'ENTER'. This will give a print out of concerned Borrower's data. For printing the data of claims option 3 of this sub-menu has to be selected and then the Borrower's code has to be key-in to get the claims data print-out. By entering QUIT the system takes us back to the 'PUSTAK' main menu'.

Browse sub-menu :- This submenu of PUSTAK may be invoked by selecting option '4' of the main menu. This sub-menu also offers 3 choices – '1' for Browsing book data, '2' for browsing user (Borrower) data and '3' for browsing the claim data. For browsing the book data after selecting '1' of this sub-menu enter the beginning string of title words (when exact title is not known) and the screen will shows all the titles having the given string of words. If no such title exists then the system ask for another string. When browsing is over 'ESC' key is to be pressed. For Browsing the Borrower's data after selecting option '2' of this sub-menu enter the name of the user. This gives name and other details of the

Borrowers with their codes. After browsing under one name, if the system puts a query whether browsing is finished ? If the answer is 'N' then it allows to enter another name. To come out of this sub-menu press 'QUIT' and system is back to PUSTAK main menu. For browsing the claims data after selecting option '3' of this sub-menu the desired accession number has to be keyed – in and whole process is same as described under modification of data sub-menu for claims data.

Circulation Sub-menu : This sub-menu takes care of Issues, Returns, claims, Fines and overdue books. This is the most frequently used sub-system of PUSTAK. The circulation sub-menu may be invoked by selecting option 5 of the PUSTAK main menu. The following functions are possible through circulation sub-menu –

1. Issuing a book.
2. Returning a book.
3. Enter/Delete Claims.
4. Scan for Overdue books.
5. Process Payments of Fines.
6. Quit or Exit from sub-menu.

For Issuing a book option 1 of this sub-menu is selected. The system asks to enter an accession number and a borrower's code. The system checks the validity of entered accession no. and borrower's code. If the accession no. is wrong or the book is already issued or under claim such information will be displayed on screen. If the borrower's code and accession number both are valid then Borrower's details are displayed on screen. These will pertain to the name of borrower, the number of books allowed, the number of books already issued, the department etc. If the Borrower's details tally type 'Y' and if not then type 'N'. If Borrower's details are O.K. The system displays Book details. The counter staff has to tally the Book details on screen and physically on book. If tallied the Books

is issued to the borrower and the accession no. will be displayed in issue records. Issue of the books is prohibited if the book details do not tally. In the issue record all the details except one are already filled in. The only one detail to be filled in is the 'SCHEME' under which books is issued e.g. Technology Lending Library (TLL), Backward Collection (BC) etc. This detail is to be filled in only if the books is being issued under any special scheme. In case of general issue this detail is not to be filled and only 'ENTER' is pressed with the cursor in the 'SCHEME' field. The expected return date or due date for the book is calculated by the system taking into consideration, the borrower's category and the 'SCHEME', so where a scheme is relevant it must be filed in. After completion of issue process for one books the system puts a query as to whether any other issues are there. If more books are to be issued answer 'Y' and repeat whole process for issuing another book. The answer 'N' takes back to circulation sub-menu. The other mode to exit from issue module is to enter Borrower's code as ZZZZZZ and pressing blanks for accession number. This returns us to the circulation sub-menu.

For Returning of books option '2' of the circulation sub-menu has to be selected. The Accession number of book, to be returned, has to be entered and followed by entering Borrower's code. The system checks these details from the details on file. If the details tally the issue record is displayed on the screen and the return of the book is processed. The relevant issue record is then obliterated from the computer files. If anymore books are to be returned choose 'Y' and if not then press 'N'. For entering of claims, option '3' of circulation sub-menu has to be selected. It is a must to enter the Borrowers' claims on computer files so that they may be considered when the book is due for another issue. After selecting option '3', the accession number of the claimed book has to be keyed-in and the system then displays the book details on the screen. If the book details are tallying then the Borrower's code is entered. When Books details and user code tally, the claim is entered onto the computer files and further claims may be processed by typing Y,

when the system asks if any more claims to be processed. By typing 'N' to the query the system takes back to the circulation sub-menu. To scan for overdue books option '4' of the circulation sub-menu has to be selected. The system almost immediately start calculating the overdue and the associated fines The fines will be indicated in the Borrower's record maintained separately – on the system. When the Borrower has more than one book overdue then the Borrower's record will indicate the cumulative fine amount.

For processing payments of fines option '5' of the circulation sub-menu has to be selected. Fines for the concerned Borrower are part of the Borrower's Record on the computer files. Whenever a fine payment is made the system ask for Borrower's code. If this code is valid then the system displays Borrower's details such a Name, Department of Borrower, and the total fine outstanding in the Borrower's name. Here the Borrower pays fine at Cash Counter and obtains a receipt for the amount paid. Then the date of payment, the receipt number and amount has to be entered. If the amount of payment is not equal to the amount of fines listed on Borrower's record, the balance of the fine to be paid is indicated in the Borrower's record. On pressing 'ENTER' the system asks for the next Borrowers' code. An entry of Borrower's code – zzzzzz followed by a 'return' will bring back to the circulation sub-menu.

Serial Control :

The worksheet/screen would require inputs like Title, Name of Publisher with address, Subscription amount, Delivery mode, Volume and Issue details, copies, Name and Address of Vendor, if any, Budget head, Date of receiving Ist issue, Expected date of next issue etc. The receipt control field is of prime importance. Unless any one of the following options is chosen, Kardex can not be done. The table below describes the kind of control a journal comes with and the corresponding options to be used –

Journal	Options to be used
Volume No. only	Vol.
Volume No. and Issue No. both	Vol. Issue
No Volume and Issue Nos. only period	Iss Yr.

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Quit Sub menu : To come out of the circulation sub-menu option 6 has to be selected

and 'ENTER' is pressed.

USING BARCODE FOR CIRCULATION : The Barcode Technology was introduced in the Library of IIT, Mumbai in August 1991. Learning from the experience elsewhere was not possible as no information on the use of the Technology in a library, particularly of the size of IIT, was available. In fact the Library of IIT, Mumbai was a pioneer to use Barcode Technology. It is worth mentioning here that ever since its introduction the Technology has never failed and has been yielding the desired results. As discussed in the preceding pages the Library of IIT, Mumbai computerized its circulation by using an in-house developed software PUSTAK, but due to heavy transactions per day and still heavier load of circulation during examinations and peak hours of the day it was found very difficult to manage the circulation. The computerization of circulation

function was based on the digits making up the accession number on one hand and borrower's code on other. At the time of each transaction it was these digits that had to be keyed in. For example, a faculty member, entitled to borrow 15 books, returns 15 books and borrows another 15 books and if the accession number of the book consists of 6 digits and the borrower's code consists of 8 digits, the number of digits that the staff at the circulation counter had to key-in was 8+15x6+15x6=188. All these digits had to be keyed in without any error, in the face of a possible disturbance from an often impatient reader across the counter. The minimum number of digits to be keyed in was 6 if the reader returned only one book. The probability of error in keying in the number was no doubt very high. Added to it was the time taken in keying in these many digits. The need for accuracy was very essential. It was, therefore, found necessary to adopt the Technology that would not only achieves the required speed but also ensure the accuracy. Barcoding was the answer.

Barcode is a series of black bars of varying breadths and white spaces between every two of them. The bars and spaces represent a series of characters or digits. These barcodes are readable only by a scanner which sends messages to the Computer that decodifies the numbers of the digits. The computer identifies such bars as '0s' and '1's and white blanks as 'offs' or 'on's. Therefore a barcode is a series of '0's and '1's representing characters or digits in such a form as only the computer can identify. To use Barcode Technology it is essential that each book or an issuable item in the library is attached with a Barcode. The Barcode needs to be printed with almost precision and pasted on a surface which is absolutely plain. It is also necessary to attach Barcode to readers' tickets in the same manner. The barcodes are read either by a ward or by a Laser scanner.

ISSUE OF BOOKS :- The borrower presents his/her Barcoded ticket alongwith the book/s. The library staff after going in for the Issue-of Book-Menu scans the

borrower's ticket and opens the borrower's account. The staff then scans the Barcode of book/s with the scanner. Each book thus gets automatically added to the borrower's account.

Return of Books :- To return the books to the library the borrower presents them at the counter. The staff goes in for the Return-of-Book-Menu to record the return of the book. The staff scans the barcodes of books which again automatically gets fed to computer and the books are cancelled from the issue record. (For returning books borrower's ticket is not necessary). The whole transaction of returning 5 books and getting 5 books issued at the same time takes only 2 minutes. The Technology proved to be advantageous in two more ways. Firstly, its high level accuracy could win the faith of its beneficiaries very soon not only in this Technology but also in the total process of computerisation. Secondly, the introduction of the Technology was received as something 'great' especially by the younger generation. The students felt 'proud of their library' because of the most modern technology being used in it.

In the implementation of the Technology there are managerial, administrative and financial problems. In case of IIT, Mumbai availability of funds and support from the authorities was no problem but the managerial problem was very big. The crucial issues were –

a) This was to be done with minimum interruption in the circulation service.

b) It had to be ensured that the new accessions would be Barcoded during the period the when the project was on.

c) It had to be seen that after this operation was over the barcoding functions would be integrated into the routine-activities of the library so that the barcoding of the new books as well as of the tickets of new members would be continuously done.

d) Provision was to be made for generating and providing barcodes for the existing books and borrower's tickets, in case they got soiled, lost or incorrectly printed.

To begin with, a pilot project was implemented taking 500 books belonging the subject Library & Information science and 70 library staff had been barcoded and used successfully. For barcoding of books the alternative strategies were – By accession number, by class number, in shelf list order, Barcoding Individual Books at Hand and moving the machine along the rack. Of these alternatives, the Barcoding Individual Books at Hand was finally selected and adopted as it offered least disturbance in the normal working of the library. Monitoring the operation was easier and the chances of a chaotic situation developing in the library were almost nil. For generating Barcodes of the borrowers it was decided to use the Employee code number in the case of staff and the Roll number in the case of students, both of 8 digits. These 8 digit codes were not expected to be in conflict with the 6-digit accession numbers. Besides, the 6-digit limit of accession numbers is not likely to change for at least another twenty years.

Need of the Project and its design – The barcoding of 2,40,000 bibliographic items and over 6,000 reader's cards was obviously an additional work for the library. It could not be done by stretching the existing resources of the library. Additional provision had to be made for man power, material and machines. It was necessary to design a time bound programme to complete the operation. It was also essential that during this operation normal work of library should not get affected. Due to these reasons it was a must to take this allocation as a project by itself. The designing of project was based on the following decisions for successful completion of the project.

a) Generating the barcodes and pasting them on each item must be done simultaneously. The book would be retained in the work station as long as it is required for generating its barcode and pasting it.

b) Each book would have the barcode at two places, so that if one gets soiled the other would be available for laser scanning.

c) Books would not be retained for the purpose for more than one working day.

d) The books which are being returned by the readers would be bar coded on priority basis.

e) Small workstations would be set up where generation of barcodes and their pasting would be done. The books would be transported to this workstation.

f) It was to be taken care that the transport of books would take less staff, time and energy and would not disturb readers and staff in the stack area.

g) To ensure accuracy in the barcodes, it was decided to do checking atleast four times during the procedure.

h) 1,000 volumes would be barcoded in a day.

i) The whole operation was to be completed within the period of 11 months.

j) It was decided that the Asstt. Librarian (circulation) would monitor the work for books and Asstt. Librarian (Periodicals) for the bound volumes of serials.

k) Following records would be maintained everyday –

    (i)   Number of books brought to the workstations.

    (ii)   Number of books entered for barcoding.

    (iii)   Number of books for which barcodes generated.

    (iv)   Number of books for which barcodes are pasted.

    (v)   Number of books which have been sent back to stacks after barcoding.

    (vi)   Stationery consumed.

    (vii)   Computer consumables used.

    (viii)   Stock provision of the consumables required for the next few days.

    (ix)   Man power used during the project.

Staff :- It was decided to employ four data entry operators and four attendants for the project. The staff required for other services in the operation would be drawn from the existing human resources of the library.

Hardware :- Following hardware was made available for 11 months :-

PC :- Five (Four stand-alone for keying-in and one for printing).

Printers :- Two (One was a stand-by to keep the work going undisturbed).

Laser Scanners :- Two

Software :- The software for generating barcode was supplied at cost by the vendor who supplied the scanners.

Operation Proper :- The work started in February 1991. It was carried out on working days during the working hours. The personnel and book trolleys for transport of books from and to the work station were drawn from the central library. The books returned at the issue counter on the previous day were taken up first for barcoding. They used to be around 500. These books were treated during the first half of the day. In the second half, the books standing on shelves were being taken for barcoding. The books were first handed over to the data entry operators who entered the data (Acc. No., Author Title combination not exceeding 30 characters) and kept them in the same order as they were entered. After entering about 500 books, the barcode was generated. The barcodes were then pasted on respective books in an assembly manner and the books were kept in the same order as they were received at all stages. The completed lot would be carried the next day morning to the shelves. At this stage also the attendants would have a

quick glance to check whether the right barcode is attached to the book by quickly checking the author/Title and a accession number (also printed on the barcode) of the book. Throughout the period the average turnover of 1000 books/items was maintained and the project was completed in 10 months instead of estimated 11 months.

The only snag in the procedure was that the books in circulation which were to be barcoded on a priority basis irrespective of their classificatory order had to be transported to the workstation twice. But it was in-evitable. New books that were being added during the period of operation were treated as the books returned at the issue counter. Thus, the barcode for them got generated automatically and pasted. After the operation was over the work of generating the barcode was made a part of responsibility of technical processing section where the classification and cataloguing are done alongwith the pasting and writing of labels and book pockets. The section was given a PC and printer alongwith the software for printing barcodes.

The cost of barcoding, as estimated in 1991, worked out to be approx. Rs. 1.50 per item. The technology is performing well and is found satisfactory for both the readers and library staff. While greater efficiency is evident on the inner side of counter, an equal amount of satisfaction is visible on the other side. Another observation is that the barcode technology may not be cost-effective in small libraries with a small number of borrowers. It may be worth introducing in a library where integrated computer-aided library management is in operation. The total cost in that case would get distributed and benefits, however intangible they are, will get enhanced.

The library of IIT, Roorkee uses Windows NT, SCO Open Server (Unix), Novell Netwave, Window 95/98/Me/2000, MS/Office 2000 and Troodon Software for

various house keeping routines and information services. Through the details of Troodon software could not be provided by the respondent but it is reported that the software is working satisfactorily for last more than 3 years for various operations of library.

IIT, Bombay was a pioneer to use Barcode technology later other IITs like Delhi, Madras and Kanpur have also gone for Barcoding. The other IITs are also likely to go for using this technology in due course of time.

IIT, Kharagpur library is using Libsys software for acquisition, technical processing, circulation and OPAC. The details of this software are given under IIT, Delhi. It also offers Electronic SDI service to faculty. In the electronic library, databases can be searched on CD-ROM as well as on Hard disk. Facility of using Internet and Ernet available in the library.

IIT, Guwahati library is also using Libsys package for circulation, Acquisition, serial control and cataloguing. On-line Information Retrieval service and current awareness services are offered through LAN.

4.2.3- Humanware :- IIT, Kanpur central library has three system managers for proper maintenance and continuous development of IIT – KLAS. As for as operation part is concerned all the 33 technical staff members of varied designations are trained to operate the system. For book acquisition and technical processing they needed 12 staff members to manage it manually, but after computerisation only 3 staff members are managing all the jobs of both the sections. To manage circulation manually they required 14 persons but after computerisation only 6 persons are enough. Similarly the periodical section was managed manually by 09 persons and after computerisation only 04 persons are managing the section.

IIT, Delhi central library does not have any post like system manager/system analyst but one Dy. Librarian is Head of Computer Application Division. He is in-charge for computer-based library services, computer Hardware problems, Library Home Page, Web-based Library and On-line Public Access Catalogue (OPAC). Out of total 36 technical staff 27 are reported to be actively engaged in working with computers. Besides these time to time the library appoints number of operators on daily wages for data entry. 04 staff members are especially trained to manage OPAC.

IIT, Madras (Chennai) central library has 03 staff members to manage Book acquisition section, 03 staff members to manage technical processing section, 09 staff members to manage circulation section and 06 staff members to take care of work of periodical section. Since this library is in the transitional phase of computerisation, they failed to give the exact number of staff members actively engaged in computer applications.

IIT, Bombay (Mumbai) central library has employed 01 system manager and 6 data entry operators for computer applications and conversion of data into standard formate respectively. The existing ministerial staff (regular typist) were especially trained for data entry, data rectification of the data bases, and management of OPAC. Besides this, the technical/professional staff members have been trained to work on computers for their day to day work and to extend efficient and excellent services to their users. It is being reported that at present 06 staff members are working for books order section while prior to computer applications 08 persons had been working to manage the heavy work loads of acquisition section. Technical procession section, after computerisation of cataloguing, is running the show with 07 staff members. While manually they used to struggle, with ever increasing backlogs, for efficient functioning inspite of 09 staff members' hard work. Now after computerisation and application of Barcode

technology the circulation section requires only two staff members at circulation desk at one time and thus only 04 persons needed for 12 hours' working of circulation desk. Manually they had to deploy a minimum of 08 and maximum (during peak hours of rush) of 12 persons to do the same job. Similarly the management of periodical section (including circulation of periodicals) is now being managed by 09 persons only instead of 11 persons required for manual operations. Gradually the total 46 staff members (excluding peons, binders and xerox – operators) are trained to operate computers and do their assigned jobs with computer applications.

IIT, Kharagpur central library has 02 system managers to take care of computerisation of the library. Total 35 staff members are trained to work on computers out of 53. Hence they do not appoint any separate operators. The staff members are trained specially to consult OPAC, for e – mail and for searching electronic databases on CD-ROM and Hard Disk in electronic library. The library is fully computerized and actually 25 staff members are associated with working on computer system.

COST-BENEFIT ANALYSIS OF AUTOMATION

5.1 Introduction :

Evaluation is an integral part of the management process. It presupposes the existence of stated objectives. Since automation of libraries has a set of objectives it can be evaluated. For evaluation we can have two criteria i.e. users' satisfaction and cost-benefit analysis. All organisations wish to produce the goods or services in the most economical way. Hence it is possible to develop evaluation procedures for performance measurement of non-profit making organisations like libraries. Traditionally the people are allergic to the evaluation and measurement of services of non-profit making or service organisations. This 'Mcnamara Fallacy' in the words of Daniel Yankelokich is as, "The first step is to measure whatever can be easily measured. This is okay as far as it goes. The second step is to disregard that which can not be measured or give it an arbitrary value. This is artificial and misleading. The third is to presume that what can not be measured easily is really not very important. This is blindness. The fourth step is to say that what can not be easily measured, really does not exist. This is suicide."

Costing a library system includes the document resources, manpower (professional and non-professional), physical facilities and other equipments which constitute the input of the library. But we have no ways of evaluating the performance or to assess at what level it is functioning.

5.2 Types of Evaluation :

Evaluation of library system and its services may be carried out at the following three levels —

    i)   Effectiveness;

    ii)   Cost – effectiveness; and

    iii)   Cost – benefit

An evaluation of effectiveness is an evaluation of users' satisfaction. Such an evaluation should determine how well an information service/library, satisfies the needs of its users. However, this type of evaluation is restricted to a consideration of how well the service meets the demands of the users (expressed needs), the latest needs being completely ignored. King and Bryant had drawn an important distinction between macro and micro evaluation. While the macro evaluation tries to answer the question, 'How well the system is performing?" and the result of such evaluation may be purely quantitative. On the other hand micro evaluation is concerned with the reasons behind the results and with the identification of ways in which the performance of the system might be improved.

Ref. – Rout (RK) :- Measuring users' satisfaction : a quantitative model. – IASLIC Bulletin 27 (1), 1982. P 1-8.

Cost – effectiveness is concerned with internal operating efficiency of a system. Such a study measures how efficiently (in terms of cost) the system is satisfying its objectives i.e. meeting the needs of its users. In other words cost – effectiveness is method of finding either a) the cheapest means of accomplishing a defined objective or b) striking a balance between the cost of developing and operating a system and the benefit derived from the system or c) achieving maximum results or value at the least cost. It is a measure of the efficacy with which various means

will achieve a given level of performance of a system, judged to be satisfactory. It is a technique with which we can attempt to find out the costs and evaluate the relative effectiveness or performance level of library systems or services. Cost – benefits analysis is a technique that attempts to set out and evaluate the social costs and social benefits of a project or system. It is usually little difficult to conduct. It attempts to determine, whether the expenses of providing services is justified by the benefits derived from it and helps in decision making process to suggest alternative services to justify the cost involved.

5.3 Evaluation or Measuring the Performance :

Evans and Borko after an extensive review of the literature, identified six possible performance criteria for evaluating library services, such as : 1) Accessibility 2) Cost 3) User satisfaction 4) Response time 5) Cost-benefit ratio, and 6) Use. These criteria are not restricted to the evaluation of library effectiveness and cost benefit consideration. The performance of any library and information service can be measured or evaluated from several possible view points, such as :

i)   How well the service is satisfying its objectives, which usually means how well it is satisfying the demands placed upon it. This is an evaluation of effectiveness of service/automation.

ii)   How efficiently (in terms of costs) it is satisfying its objectives. This is cost – effectiveness evaluation.

iii) Whether the service (being automated) justify its existence. Keeping the service as constant, it suggests to find out alternative methods to justify the costs.

In addition to the above considerations the efficiency of the library system can be viewed as :

a) The ability of the library to deliver a particular item when it is needed.

b) The ability of the catalogue and the shelf arrangement to disclose the holdings of particular items or of materials on particular subjects.

c) The ability of reference staff to answer questions completely and accurately.

d) The speed with which a reference query can be answered or a literature search conducted and the results presented to the library users.

e) The speed with which a particular item can be located when needed.

f) The amount of effort that the user must himself expand in exploiting the services of the library (including factors of physical accessibility of the library and its collections, the size and the quality of the library staff and the ways in which the collections are catalogued, indexed and shelved).

The above measures bear a similarity to the performance criteria for an Information Retrieval System. Information services, like most other services, generally will be evaluated in terms of time, cost and quality factors. Cost does not necessarily mean monetary cost, although if the information service does charge its users directly, the actual cost of the service will be an important characteristic by which the service will be judged. In case where no direct charge is made for service, other type of cost factors still are important. One of these, is the amount of efforts a user must expand, a) In using the system (and in learning how to use it), 2) In interpreting the form of output provided by the system, and 3) In obtaining the actual documents referred to by the system.

5.4 Cost – Benefit Analysis of Computerisation :

Cost – benefit analysis happens to be one of the most important aspects of management in general and of decision making in particular. To study the feasibility of any system, to valuate it or to choose one system out of several alternatives, the decision making authorities have to make a cost – benefit analysis. In this process total costs involved in terms of equipments (machines), material and manpower have to be taken into account and also value of all the benefits i.e. economy in terms of money, efforts and time involved, being accrued from it, have to be calculated. If the value of benefits is more as compared to the cost involved, the system is suitable and if the results are opposite to this the system is misfit. It is, therefore, essential to have a cost – benefit analysis of computerisation instead of following others blindly. Here an attempt is being made to highlight some problems involved in making cost – benefit analysis of computerising any of the library services or operations –

To begin with, an exercise in costing of any activity or service in the library is almost an impossible task for the simple reason that there exist many immeasurable components in the library operation. This is because the operations or services of any library are not mechanical. They required lot of human involved i.e. the library staff of different categories and also that one operation in some or other way is linked or dependent upon other. To cite an example, the cost of one hour work of a Deputy or Asstt. Librarian is not equivalent to the same time of a clerk or Junior Professional Asstt. in terms of money. Similarly for calculating benefits of the one hour time of a student or technician saved due to computerisation is not equivalent to one hour of a senior professor in an academic institution or General Manager of a business house. One comes across hundreds of such items while computing the cost and returns of the library service. However, it does not mean to be an agreement against the cost – benefit study of library

operations, but that precise estimation of cost as well as benefits in terms of money is difficult to arrive at in such an exercise.

Several attempts have been made in evaluating the library services. All of them suggest that the only convincing and valid criteria for measuring the library services is the satisfaction of users. It is also suggested that the satisfaction of the library staff would also be considered as a factor that ensures the validity of the users' claim of their satisfaction with the library services. However, it will be unianimously agreed upon that the satisfaction, whether of users or library staff is fully an abstract phenomenon and can not be measured to concrete terms. Also satisfaction is highly subjective i.e. levels vary from person to person and even more to the same person at different states of minds or to say moods. Still there is need for providing some tool by which the library services could be measured in concrete terms. Normally, those who are desired to evaluate library services or the impact of computerisation are non-librarians and may be even non-academicians. The library has to confront with such persons who could be convinced only by the language of rupees. Hence the librarian must attempt to convert at least those parts of the immeasurables that can be converted into figures and into rupees. For an example, to calculate users' satisfaction, it is possible to calculate the users as well as the use. Obviously, the use can not be fully calculated in terms of its real value but one can be successful in measuring some parts thereof.

The measurable aspects of the library services are –
   a) the number of users using the library;
   b) number of visits to the library by the users – in a day;
   c) number of books being issued by the library in a day;
   d) number of books being consulted by the users in the library;
   e) number of loose – issues of the journals being consulted by the readers;
   f) number of articles xeroxed from the library resources;

g) the time spent by readers in locating books and getting the books issued;

h) use of the bibliographical and information services offered by the library;

i) how many times the CD-ROMs, Videos films etc. are being used and so on.

These items are no doubt measurable and indicate the extent to which the library is serving the purpose for which it is being set up, but however they can hardly be measured in terms of money.

It is difficult to compute the returns on the expenditure incurred on the computerisation of the library in terms of money, but applying the same logic in respect of library services an attempt can be made to estimate the going on account of computerization. The most relevant factor would be the increase in the use of the library due to computerization. One can argue that if more readers are found to visit the library after it has been computerized and if the readers spend more time in the library than they were doing in the past (i.e. before computerization), then the computerization has paid the dividents. Similarly if the library services are used on a larger scale after the computerization, it can be called as cost – effective. However, this is difficult to calculate it in terms of money. Some other gains, which may be called to be psychological benefits, are as follows –

a) Mental fatigue that is caused due to literature search is saved for many readers and library staff.

b) The relief from physical fatigue of standing and consulting the catalogue is another advantage.

c) The status conciousness which is ever existing in the minds of library staff and proves to be an obstacle in the healthy functioning of total library activity, gradually fades away as the use of computers increases.

d) The entire system becomes highly disciplined and regulated.

A slightest diversion can not simply be tolerated by the machines. This influences the behaviour of the staff as well as that of readers in the library and has favourable effect on the total working and service environment.

e) The cleanliness that goes with sophisticated machinery leads to the pleasant environment in the library.

f) The level of accuracy involved in many operations is very high. This surely affects the quality of output of the parent organisation.

The above will ever remain immeasurable. However, the benefits of computerisation that can be calculated in terms of money are the manpower saved on current activities and the manpower saved on additional services that become possible due to computerisation can also be computed in monetary terms. In order to do the cost-benefit analysis of a library system one has to assess the expectations from the system. The system requirements are –

a) Better customer services.
b) Faster information retrieval.
c) Quicker notice / reminder preparation.
d) Better billing accuracy.
e) Lower processing and operating costs.
f) Improved staff efficiency.
g) Consistent procedure to eliminate errors.

5.5 Cost and Benefit Categories :

In developing cost estimates for a system, we need to consider several cost elements. Among them are hardware, personnel, facility, operating and supply

costs. Hardware costs relate to the actual purchase or lease of the computer and peripherals like printer, disk drive, tape unit etc. Determining the cost of hardware is generally more difficult when the system is shared by various users than for a dedicated stand alone system. In some cases, the best way to control for this cost is to treat it as an operating cost. Personnel costs include EDP staff salaries and other benefits (like medical reimbursement, insurance, leaves, leave travelling allowance etc.) as well as pay for those involved in developing the system. Costs incurred during the development of a system are one – time costs and are named developmental costs. Once the system is installed, the costs of operating and maintaining the system become recurring costs. Facility costs are expenses incurred in the preparation of the physical site where the computer will be in operation. This includes wiring, flooring, acoustics, lighting, air-conditioning etc. These costs are treated as one-time or non-recurring cost and are incorporated into the overall cost estimate. Operating costs include all costs associated with the day – to – day operation of the system; the amount depends on the number of shifts; the nature of the computer, and the calibre of the operating staff. There are various ways of covering operating costs. One approach is to treat operating costs as overhead. Another approach is to charge each authorized user for the amount of processing they request from the system. The amount charged is based on computer time, staff time, and the volume of the output produced. In any case, some accounting is necessary to determine how operating costs should be handled. Supply costs are variable – costs that increase with increased use of paper, ribbons, disks and the like. They should be estimated and included in the overall cost of the system.

A system is also expected to provide benefits. The first task is to identify each benefit and then assign a monetary value to it for cost/benefit analysis. Benefits may be tangible and intangible, direct or indirect. The two major benefits are improving performance and minimizing the cost of processing. The performance

category emphasizes improvement in the accuracy of or access to information and easier access to the system by authorized users.

Minimizing costs through an efficient system – error control or reduction of staff – is a benefit that should be measured and included in cost – benefit analysis.

5.6 Procedure for Cost / Benefit Determination :

Building a computer-based system is an investment and not the expenditure. The difference between two is that expenditure is done to fulfill the needs while the investment is made to realize a return on it. Costs are incurred throughout the life cycle of system. Benefits are realized in the form of reduced operating costs, improved corporate image, staff efficiency or revenues. To what extent benefits overweigh costs is the function of cost – benefit analysis. Cost – benefit analysis is a procedure that gives a picture of the various costs, benefits and rules associated with a system. The determination of costs and benefits entails the following steps–

    (i)   Identify the costs and benefits pertaining to computerization.
    (ii)   Categorize the various costs and benefits for analysis.
    (iii)   Select a method of evaluation.
    (iv)   Interpret the result of analysis.
    (v)   Take action.

Identification of costs and benefits :

Certain costs and benefits are more easily identifiable than others. For example, direct costs, such as the price of a hard disk, are easily identified from company invoice payments or cancelled cheques. Direct benefits often relate one-to-one to direct costs, especially savings from reducing costs in the activity in question. Other direct costs and benefits, however may not be well defined, since they

represent estimated costs or benefits that have some uncertainty. A category of costs or benefits that is not easily discernible is opportunity costs and opportunity benefits. These are not easy to identify. The costs and benefits may be tangible or intangible, direct or indirect, fixed or variable.

Tangible or Intangible costs and benefits :

Tangibility refers to the ease with which costs or benefits can be measured. An outlay of cash for a specific item or activity is referred to as a tangible cost. They are usually shown as disbursements on the books. The purchase of hardware or software, personnel training, and employee salaries are tangible costs. They are readily identified and measured. Costs that are known to exist but whose financial value can not be measured accurately are referred to as intangible costs. For example, employee morale problems caused by a new system or lowered company image is an intangible cost. In some cases, intangible costs may be easy to identify but difficult to measure. For example, the cost of the breakdown of an on-line system will cause wastage of Time and energy of the users and staff. How much actual loss is caused due to this ? It can not be measured in terms of money. In other cases, intangible costs may be difficult even to identify, such as an improvement in customer satisfaction stemming from a real – time order entry system. Benefits are also classified as tangible or intangible. Like costs, they are often difficult to specify accurately. Tangible benefits, such as completing jobs in fewer hours or producing reports with no errors, are quantifiable. Intangible benefits, such as more satisfied customers or an improved corporate image, are not easily quantified.

From a cost accounting point of view, costs are handled differently depending on whether they are direct or indirect. Direct costs are those with which a figure in rupees can be directly associated. They are applied directly to the operation. For

example, the purchase of a box of diskettes for Rs. 900.00 is a direct cost because the diskettes can be associated with the rupees expended. Direct benefits also can be specifically attributable. For example, a new system that can handle 25% more transactions per day is a direct benefit. Indirect costs are the results of operations that are not directly associated with a given system or activity. They are often referred to as overhead. A system that reduces overhead realizes savings. If it increases overhead, it incurs an additional cost. Insurance, maintenance, protection of computer centre, heat, light and air conditioning are all tangible costs, but it is difficult to determine the proportion of each attributable to a specific activity. Indirect benefits are realized as a by-product of another activity or system. For example, the data, entered once at the time of ordering the documents, is used for checking the bills, accessioning, cataloguing and providing information services like compilation of bibliographies, CAS and ready reference services. These indirect benefits are difficult to valuate in concrete terms. Direct and indirect costs and benefits are readily identified for tangible costs and benefits, respectively.

Some costs and benefits are constant, regardless of how well a system is used. Fixed costs are sunk costs i.e. they are fixed and do not change. Examples are straight – line depreciation of hardware, and insurance. In contrast, variable costs are incurred on a regular basis. They are usually proportional to work volume and continue as long as the system is in operation, e.g. computer stationery, inkjet of printer etc. Fixed benefits are also constant and do not change. An example is a decrease in number of personnel by 20 percent resulting from the use of a computer. The benefits of personnel savings may recur every month. Variable benefits on the other hand, are realized on a regular basis. The amount of time saved is variable and indirect benefits. Savings are realized when there is some kind of cost advantage. A cost advantage reduces or eliminates expenditures. So we can say that true savings reduce or eliminate various costs being incurred.

The Planning Evaluation and Review Technique (PERT) and Critical Path Method (CPM) network techniques are well developed management tools, which were developed concurrently with same purpose. The term PERT/CPM or network analysis refers to the general method of planning, scheduling and controlling of progress on various constituents of a project. This technique can be effectively used in detail planning and scheduling of library projects. Due to time and resources' constraint for conducting a Library Systems Study Project, the system analyst has to pre-plan the time schedule for its completion. Such constraints could be caused due to the limitation placed by the authorities to finish the project within a given time and due to financial, technological and manpower limitations. It is not only essential to find out the optimum project duration but also to control the performance time to series of activities of the project to finish it on schedule. Not controlling the schedule implies an increase in the sum of direct or indirect cost. For this purpose, one has to plan and establish time estimates for completion of each activity of the project. Fix target times for its start and finish. Synchronise schedules of concurrent and successive activities of the project. PERT/CPM, the project management techniques are based on network model, and are used for developing a workable plan of a project involving :

a) Activities that make up the project, including specifications of their interrelation.

b) Times estimates for the completion of each activity within the complete project and total time requires to complete the entire project.

c) Controlling, synchronising and co-ordinating the sequences of activities of the project.

d) The sequence of activities that will consume the most time in reaching the end event.

A network model is a diagram through which complete picture of a project plan showing logical sequence of the activities and events and interrelationships of various activities is presented. An activity is any segment of a project that consumes time and resources and has a definable beginning and ending. An event means beginning and ending of an activity and does not consume time. It shows a note worthy or significant point in a project. For example, in a library system receipt of books and books bills are starting events, which trigger further actions. To make an inventory of a purchased book in an accession register is an activity and an accessioned book is an end event.

The advantages of a network analysis may be summarised as follows –

a) It forces a thorough pre-planning of the task.

b) It increases co-ordination.

c) It identifies trouble spots, often in advance, and pin points responsibilities.

d) It refines thinking and increases the user's awareness of the problems involved, and their relative importance in the total operation.

e) It focuses the management's attention on those activities that are or likely to be in difficulties, rather than on activities that are progressing smoothly and therefore need no attention.

f) It facilitates the hand over if information during changes in management and is a valuable aid when issuing orders.

g) It shows optimum start and finish times for each activity in an operation.

h) It enables the plans to be revised in the best way to suit changed circumstances.

i) It suggests where alternative methods should be sought.

j) It allows progress reporting and the issue of orders without complete loss of security.

k) It allows certain operations that follow a set pattern to be partly pre-planned, so speed up the final planning.

l) It is an important means of training personnel in the techniques of handling the operations.

m) It forms a useful comprehensive record that requires a minimum of storage space.

PERT/CPM can be effectively used in detailed planning and scheduling of library projects, such as analysing the library systems or operations and improving their performance; construction of a library building; shifting of library collection to a new location or building; transferring library staff from one place to another; making major changes in the working of a library department, planning and re organising different departments of a library, and so on. Thus, we find that network analysis is the tool that systems analysts can use for –

a) Breaking down the project into a series of activities and events and arranging them in a logical network to accomplish the objective of a project successfully.

b) Estimating the duration and resources requirements of each activity, drawing up a schedule and finding which activities control the completion of the project to increase the chance of completing the project by target date.

c) Re allocating money, men or other resources to improve the schedule and do rescheduling to reduce the total time required to complete the project.

d) Controlling and monitoring progress as the project proceeds.

The above description makes it quite clear that cost-benefit analysis of library system can not be done like business enterprises and the calculation of benefits can be only in terms of economy in the manpower and the time taken to perform a job. Say for example if a particular library, before computerisation needs 6 persons for acquisition and 6 persons for cataloguing, but after computerisation the whole work is managed by 9 persons only then the economy in staff is by 50% or if the library needed 04 staff members to do the work of circulation counter before computerization and only 02 staff members to do the same work efficiently and effectively after computerization then we shall have 100% economy in staff. Similarly the time taken by the library staff in placing the order, checking the receipt, sending reminders for non-receipts, checking the bills and accessioning 1000 volumes of books is 200 hours before computerisation and only 50 hours after computerization of all the above jobs then the economy in terms of time is 200%. It is for this reason that in the section E of my questionnaire only 5 questions were raised. Question no. 1 was to find that in which year the library could install a computer system or have to share a mainframe with other departments. Question no. 2 and its subsections relates to the cost of computer, its peripherals including stationery, manpower developing cost and recurring cost of maintenance. Question no. 3 desires to know that how many staff members a particular section of library had pre-automation and the same of post-automation. Question no. 4 makes an attempt to find economy in time, and through question no. 5, the information is gathered about the new services the library could introduce after computerization. The answer may have two implications, the one is that the computerization made it possible to spare the staff for other new services

and the second is that by using computers the same data can be utilized for different activities, for example the bibliographical descriptions of the books entered at the time of placing orders, can be used for accessioning, cataloguing, preparation of list of new arrivals, and also for circulation.

5.7. Details of Costs and benefits of computerisation in Libraries of Indian Institutes of Technology :

The library of IIT, Kanpur has its own mini-mainframe computer system. The cost of installation including hardware is reported to be Rs. 15,000,00 (Fifteen Lacs) as non-recurring and Recurring cost, including after-sale service and stationary etc. is reported to be Rs. 5,000,00 (Five Lacs). The recurring and non-recurring costs include salary for research engineers, retrospective conversion, bar-coding, training of staff, site preparation, peripherals and air-conditioning. The benefits accruid of computerisation are – Prior to automation the library needed 06 staff members for the work of ordering of books, passing the bills and accessioning etc. jobs of book acquisition and 06 staff members for classification, cataloguing, shelf list preparation etc. jobs of technical processing. And after automation the jobs of both these section is managed efficiently by 03 staff members only. This shows that against 12 staff members only 03 are needed after automation i.e. an economy of 400%. Similarly 14 staff members had been working in circulation section for registration of members, preparing borrowers' cards, issuing and returning of books, sending reminders and charging over-due fines etc. before computerisation and after computerisation only 06 staff members are performing all the jobs of circulation section. This shows an economy of 233% in staff. In periodical section 09 staff members had been working for subscription of journals, sending reminders and control of current and back volumes of the journals before computerisation and after automation only 03 staff members are capable of doing

all the jobs. This is again an economy of 300% in number of staff. The other indirect benefit is that before automation only 01 staff member could be put to take care of reference services to the users. As is evident that to cater to the needs of more than 6,000 users on campus and above 500 users seeking reference assistance per day 01 staff member was very insufficient. After automation 06 staff members are engaged in reference service. This means that efficiency of reference services and in turn users' satisfaction is increased six times. This is a remarkable, though can not be calculated in terms of money, achievement of automation. Also, after computerisation the library could introduce current awareness services in Mathematics, Psychology, Sociology, Management, Chemical Engg., Mechanical Engg., Civil Engg., Computer Science, Electrical Engg. And Electronic Engg.

Besides, the library could introduce Selective Dissemination of Information (SDI) service, on-line catalogue search, current contents search, New arrivals, journals subscriptions, journal holdings, circulation queries, book – Indent queries etc. for the convenience of users after computerization. These all benefits, though immeasurable, are very important and a real profitable return of the costs involved in automation.

The library of IIT, Mumbai (Bombay) had to put a non – recurring cost of Rs. 17,39,000/- (seventeen lacs and Thirty Nine Thousand only) on purchase and installation of its main frame Maxman, pentium and PCs and had to put another Rs. .5,00,000/- (Five lacs only) on manpower development for computerisation. Every year the recurring cost of maintenance, stationery and others comes to Rs. 90,000/- (Ninety thousand only). The achievements of the library in the field of automation are as under –

1. Creation of database of about 2,00,000 books with those minimum bibliographical details as are needed for circulation.

2. Creation of the database consisting of approx. 75,000 bound volumes of periodicals (of approx. 3,500 titles).

3. Creation of database of 1,550 current periodicals.

4. Database of faulty publications consisting of 3163 records.

5. Creation of about 7,000 readers records including faculty, supporting staff, students, corporate members, alumni member.

6. Barcoding of about 2,00,000 books and 75,000 bound volumes of journals.

7. The circulation function has been fully computerised. The other house keeping operations such as book acquisition, cataloguing and serial control are also computerised.

The itemwise costs involved in the computerisation of above activities are listed below –

PC – AT (2 nos.)	Rs. 80,000.00
PC (11 nos)	Rs. 2,53,000.00
File server – 300 MBI	Rs. 3,50,000.00
Printer (3 nos.) – 80 columns	Rs. 30,000.00
Active hub (2 nos.)	Rs. .20,000.00
Electronic Typewrite (2 nos.)	Rs. 30,000.00
CD – ROM Drive (1 no.)	Rs. 30,000.00
Barcode Laser Scanner (2 nos.)	Rs. 1,08,000.00
Voltage Stabilizer – 2 KVA (4 nos.)	Rs. 48,000.00
Isolation Transformer (2 nos.)	Rs. 60,000.00
UPS 1 KV	Rs. 65,000.00
A.C. (2 nos.)	Rs. 70,000.00

LAN Software	Rs. 20,000.00
Compensation of a programmer for 3 years	Rs. 1,10,000.00
Compensation of attendant for 3 years	Rs. 40,000.00
Compensation of data entry operator (2) for 3 years	Rs. 2,40,000.00
Compensation of Supervisor for 3 years	Rs. 1,10,000.00
Stationery and consumables for 3 years	Rs. 20,000.00
Cost of furniture (15 chairs + 15 tables)	Rs. 40,000.00
Miscellaneous	Rs. 15,000.00
Total	Rs. 17,39,000.00

The benefits obtained against this expenditure, as reported by Dr. H.S. Waydande are – The Acquisition or Book Order Section after computerisation could spare 02 professionals, the Technical Processing Section could manage its work efficiently with 1 supervisor and 06 semi-professions i.e. sparing two professionals (cataloguers), the circulation section while operating manually needed 11 staff members but after automation it is functioning with 07 staff members, the Journals' section, after computerisation, could relieve 02 professional staff. Before computerisation there was no separate staff for reference work and service and users were guided only off and on by the staff doing other jobs, but after computerisation 03 professionals are fully engaged in providing reference assistance to the level of satisfaction of users.

Besides above, the other tangible benefits of automation are calculated in terms of money by Ganpule and Waydande. The functions of cataloguing operations are being done by the computers resulting net saving on search time as : Average 500 books are being issued out of the library of which 250 are searched by readers through the catalogue. If we take that a person can not search more than 100 books on the traditional catalogue per day and searching 250 books on computer will be half a day's job, there is net saving of 2 mandays of a reader per day on account of

the catalogue search. The search is done by cross section of users ranging from students to senior professors. The savings can be calculated in terms of money on the basis of compensation of item of one readers at middle level, say, who draws Rs. 9000 p.. Thus there is a saving of Rs. 18,000/- p.m. on account of the catalogue search by readers. Library needs to search 100 books per day in the catalogue in its day to day in house activities. After automation this is being done in half an hour. Thus, there is saving of Rs. 3000/- equivalent to the compensation of one employee per month. The generating of catalogue cards needed the service of 02 typists when done manually. This is totally eliminated ,as the entry made by Book Acquisition Section can be manipulated for generating catalogue entries. This results into saving of Rs. 16,000/- per month. Half a day of a library professional on the counter was being spent on answering readers' queries, such as the status of a book, claims, fine etc. This can now be done by the readers themselves resulting into a saving of Rs. 4000/- per month.

Other than the above benefits, there are additional facilities that could be rendered due to automation for which no cost need be incurred. The cost that would have been necessary, had there been no computerisation could be taken as benefits. Though these facilities were considered as part and parcel of any library but could not be offered before automation due to shortage of manpower.

The analysing library operations such as maintaining statistics of the users of the library, the types of books used etc. would have taken the services of 01 senior professional, which can now be done without such a person. Thus, there is net saving of at least Rs. 4,000/- per month. The SDI services when given manually required 03 professional staff, 01 typist and atleast half time of an officer costing roughly Rs. 40,000/- p.m. This can be done now by 01 professional and 01 typist/Data entry operator. Hence there is a saving of Rs. 15,000/- per month. It can easily be estimated that a period of about 3 months of a Ph.D. student is spent

on literature search done manually, often it is still more, but now when the library has an online access to national and international databases using Internet and to the database of library through LAN there will be a saving of atleast 02 weeks per research student I.I.T., Bombay enrols 200 research student per year and gives them 43,000/- p.m. scholarship. Saving of 400 weeks i.e. about 100 months of their time saves Rs. 3,00,000/- per year. All the above savings can be summarised, considering about 20% increase in salaries of staff during last 3 years i.e. from the date of collecting the data, as follows –

i) Savings on existing functions   -   Rs. 2,66,000/-
ii) Additional services   -   Rs. 2,28,000/-
iii) Research workers' time saved -   Rs. 3,00,000/-
                            Total   **Rs. 7,94,000/-**

The services of a programmer, a supervisor (for hardware maintenance) and a data entry operator will continue to be required. The annual cost of there would be {(6,000 + 6,000 + 3,000)x 12} = Rs. 1,80,000/-

The net benefits, therefore, would be (Rs. 7,94,000 – 1,80,000) Rs. 6,14,000/- It can be said that a very conservative estimate benefits on measurable factors of library services work out to the extent of Rs., 6,14,000/- per year on the investment of Rs. 17,39,000. Taking 10-20% positive or negative it can be said that the minimum savings/benefits will be of Rs. 6,00,000/- per year.

In addition to the above tangible benefits, the automation also has following intangible or psychological benefits –

i) Mental fatigue that is caused due to literature search is saved for many readers and the library staff.

ii) The relief from physical fatigue of standing and consulting the catalogue is another advantage.

iii) The status consciousness which is ever existing in the minds of library staff at different levels and which proves to be an obstacle in the healthy functioning of total library activity gradually fades away as the use of computers increases.

iv) The entire system is highly disciplined and regulated. A slightest diversion can not simply be tolerated by computers. This influences the behaviour of the staff as well as readers in the library and has a favourable effect on the total working and service environment.

v) The cleanliness that goes with the sophisticated machinery leads to the pleasant environment in the library.

vi) The level of accuracy is very high which surely affects the quality of output of parent organisation.

The library of IIT, Madras could not provide the costs of computerisation, but considering the costs of hardware and software in other IITs it can be estimated to about lacs. This library also failed to specify the savings on staff but reported that only 03 staff is managing all jobs of Acquisition and only 03 the work of Technical Processing Section, hence it is evident that computerisation has resulted a saving of atleast 50% staff i.e. 06 staff members. Similarly 06 persons are working in Periodical section and 02 in Reference section which shows economy in staff taking into account the quantum of work. Since the circulation system is not computerised i.e. work is in progress they require 09 staff members to work in two shifts. Under present circumstances on a saving of 06 staff members the

tangible benefits comes to about Rs. 3 lacs per annum. The other intangible benefits mentioned in case of IIT, Bombay remain all the more same.

The library of IIT, Kharagpur have reported that though the computer was installed in the year 1994 but till the year 2000 the work of computerisation was in progress and so the costs could not be calculated. However, the library has developed OPAC facility of searching electronic databases on CD-ROM and Hard Disk and electronic SDI service to faculty (monthly) which has its tangible benefits i.e. savings on hours of searching information and references by users and library staff and intangible benefits i.e. satisfaction of users and accuracy in services. The automation has made it possible to provide users with the facilities of Internet, Ernet and LAN which has its own benefits as discussed earlier.

The library of IIT, Delhi reported that costs have not been worked out exactly but it is nearly 18 lacs on hardware and software. The benefits in terms of savings on staff or time involved in each and every activity have also not been calculated. But the improvement in services and introduction of new facilities are observed clearly after computerisation which are obviously intangible benefits. The benefits of computerisation include access to about 1400 electronics journals in full text. This results saving of space, staff and money as compared to subscribing hard copies of the same 1400 titles of the journals. The library offers very exhaustive and fast information services using 12 CD-ROM databases. The OPAC of the library is operational on Internet and Intranet and is accessible to users from all comers of the campus. The library has developed 4 separate databases, one of serials, one of text books, one for book bank collection and one for Ph.D. theses available in the central library. Under computerised services the library developed web-based digitized collection for distant and continuing education in Information Technology. The online directory of courseware is also available on Internet. It

also Developed and maintained Institute's web page. Library House Page offers the following information/services –

a) Guide to the central library, b) Collections and library services, c) Library layouts and floor plans, d) Library hours and membership, e) Computerisation Programme, f) Network connections, g) Web-based Library OPAC, h) Web-based on-line kardex of journals, I) TELNET to DELNET databases, j) Link to CD NET system on campus LAN, h) Recent Additions to the Book collections, l) Web-based access to full text e-journals etc. The introduction of all these services and facilities could be possible only due to computerisation and it is a great benefit.

The central library of IIT, Guwahati as compared to other IITs is being established lately i.e. in 1995 and has smaller collection and users. But is being computerised fully. The whole library automation system is initiated by the Computer Science Department and the costs are incorporated with the budget of institution therefore the library failed to give the details of hardware mentioned by them and LIBSYS software can be estimated to cost above Rs. 10 lacs. As for benefits are concerned, the total library operations are managed by 11 staff members who are trained to work with computers. The Book Acquisition Section Technical Processing Section, Periodical Section and circulation section each is managed by only 02 staff i.e. saving of atleast 50% staff. The library collection is available on LAN and the services are good. Thus it can be calculated that the intangible benefits are much more than the costs involved on computerisation.

The university of Roorkee is being declared as 7th IIT in 2001, though the university was established in 1847. The library started computerisation in 1997. The costs of hardware are included in the budget of the institution. However the cost of software TROODON 2-0 is being reported as 1.20 lacs. The subscription amount for connectivity to BSNL Networking facility is Rs. 7,350/- per annum.

The total recurring expenditure is reported as 1.72 lacs. The benefits accrued from computerisation are many. The users have on-line access to INFLIBNET and DELNET. They also get facility of INTERNET and Web OPAC service. The users can have access to the databases of library as well to the other remote databases. The library offers computerised lending services, Reference service, CD-ROM database services, contents pages services, Indexing and Abstracting services, current Awareness Services and Selective Dissemination of Information services etc.

5.8. Conclusion :

On the basis of above description it can be analysed that though the cost of computerisation is high i.e. ranging from 15 to 22 lacs as non-recurring and minimum Rs. 2 lacs as recurring for computerisation of almost all important work and services in a library like IIT which has a large number of users and a huge collection of varied nature. But the tangible benefits are also equivalent to Rs. 3 lacs or more per annum after subtracting recurring costs. Besides this the savings of mental fatigue to the users and staff, economy of time in providing efficient services, and above all a sense of satisfaction among the users and staff are intangible benefits. Finally it may be concluded that the computerisation is beneficial to the sizeable libraries like those of Indian Institutes of Technology.

CONCLUSION

The idea of taking up this study as a topic of research was conceived in 1994 when only 5 Indian Institutes of Technology were existing and all of them had been in the early stages of computerisation. Having worked as a professional in the central library of IIT, Bombay from 1979 to 1985 the vastness of library system prevailing in IITs was known. Also the problems faced by the staff of library and computer scientists in developing a software for library use in the early 1980's was known. During the previous decade the libraries of different IITs had succeeded in automating the activities fully or partially and hence there was a curiosity to know about the computer systems developed. Also, during past ten years the movement of automating libraries was in its full swing. The agencies like University Grants commission, Ministry of Human Resources Development and Councils for Research in various disciplines took initiative, released grants and issued instructions that computer may be used by the libraries coming under their purviews. It is being noticed that librarians of many small and medium sized libraries are facing problems in computerisation for the lack of awareness. Many of them do not know how to proceed for computerisation. What activities can be automated ? What infrastructure is required? And which software be used ? In some of the libraries computers have been purchased because grants were made available for the purpose, but the computers could not even be installed for some or other reasons. Under this project an attempt is being made to study the development of computer systems in different IITs' libraries which may be useful for other libraries to seek guidance in developing their own system i.e. Hardware, Software and Humanware. Under Chapter-3 system design for different activities of libraries have been covered and detailed descriptions of files are given. In the same chapter small programs for automating different activities are illustrated and

supported by the flowchart diagrams. These may be useful for those medium and small sized libraries which can not afford to go for costly software packages like Libsys. Such libraries on the basis of developmental growth of automation at IIT Libraries, covered in chapter 4 and 3 of this project, shall be in a position to chalk out a feasible plan for automating their different activities. If the library wish to develop its own software it should be possible for them by taking help of software experts and taking guidance from chapter 3 and 4 of this study.

The hypothesis in present study are being tested whether they stand accepted or rejected. The following are the hypotheses of this study —

1. Automation of Libraries in India is in its cradle stage.

2. The seven IITs are the most advanced centres of study and research and have suitable infrastructure for Automation of Libraries i.e. adequate funds, well qualified staff and well developed computer systems.

3. All the Seven IITs have computerized their libraries for some or other activities but there is not much uniformity in them.

4. The different IIT libraries have a lot of variation in their system-design. This study may highlight the best system-design which could prove as a pioneer for the automation of other Scientific and Technical Libraries in India.

5. IIT Libraries being rich in resources have developed a Network for their use particularly in the field of Science and Technology. They can function well as nodal points for Information Storage and Retrieval.

6. The costs of computerisation, inspite of decrease in prices, are high but the benefits accrued from it are much more.

7. This study would enable to explore the feasibility of automating other large and medium sized libraries.

Hypothesis –1

It is an outcome of observation that only a small fraction of total libraries in India have been automated. Out of the total libraries having computers less than half have computerized their activities and services. In chapter –1 it is stated that less than 10% libraries are computerized. It shows that the automation in Indian libraries is in its early stage.

Hypothesis –2

The data relating to organisation of IIT libraries in chapter –2 of this study prove that these libraries are rich in resources. Table –1 shows that other than the library of IIT, Guwahati (Total collection around 1,00,000 vols) all the other IIT libraries have approx .4-5 lacs of volumes in their collection. Table –2 shows that the minimum number of users in the libraries under study is about 2,000 (Guwahati) minimum and approx. 10,000 (Mumbai) is maximum. Table –3 represented that number of staff i.e. ranging from 26 to 82. All these table and description of organisation and services prove that the libraries under study have a well developed infrastructure.

Hypothesis –3

The description made under chapter-4 reveals that the library of IIT, Kanpur is fully computerized i.e. digital library, the library of IIT, Mumbai has computerized its all the housekeeping routines (except classification) and is providing information through LAN and other networks. IIT, Delhi and Chennai are in the

process of using Bar-code for circulation. IIT, Mumbai is making use of Bar-code for circulation for past 6 years while the IIT, Kanpur has its own software for circulation of books. This reveals the lack of uniformity in computerisation of libraries.

Hypothesis –4

It has been observed under chapter-4 of this study that the libraries of different IITs has lot of variation in selection of hardware, software and humanware. But there is one similarity in hardware that each of the libraries has atleast one mainframe with 15-25 terminals and 20-30 personal computers. In the selection of software the final choice of IIT, Delhi, Kharagpur and Guwahati is on LIBSYS, while IIT, Kanpur developed its own software under the name iit-KLAS, IIT, Mumbai developed its own software using Fox pro for some of its activities and bought 'SLIM' for serial control. IIT, Roorkee uses 'Troodon' software package. It is observed that in hardware 'Compaq' and 'LIBSYS' in software are the common choices. In the same chapter it is also found that there is variation in training of technical staff to work on computers.

Hypothesis – 5

It has been observed that the libraries of IIT, Kanpur, Delhi and Mumbai have developed LAN in their campus and have also got links to 'Ernet' and 'Internet'. The libraries of IIT, Chennai, Kharagpur, Guwahati and Roorkee also have facility of Internet but lack the availability of LAN. Having lots of common in literature and information needs of users in the same disciplines the seven IITs may go for developing their combined network. Each of the Libraries may also function as nodal point in its region. As to this date these libraries do not have any such plan.

Hypothesis – 6

The study made under chapter-5 reveals that the initial cost of computerisation in libraries of IITs ranges between Rs. 15-22 lacs as non-recurring expenditure and approx. Rs. 2 lacs as recurring one which is definitely very high. The benefits calculated in context of IIT, Mumbai show the figure of about Rs. 5 lacs as recurring saving. Thus it is proved that computerisation is also beneficial in terms of memory besides the intangible benefits.

Chapter 1 is concerned with the policy and decision making of automation. It covers the forces behind automation, the activities ought to be automated and feasibility study of automation. Small libraries having a few thousand of books, poor resources, small number or users and one or two professional / semi-professional staff members, may not find computerisation useful and successful. It is expected that the information gathered here would help in knowing that whether the computerisation is suitable or not for a particular library and the individual librarians shall be able to take decision in this behalf by going through this chapter. Chapter-2 of this study describes the organisation of libraries of seven Indian Institutes of Technology. The vastness and variety of collection is evident for it is found that each library has 2 to 5 lacs of volumes in collection which includes books, current periodicals, bound volumes of periodicals, standards, patents, microfilms and microfiches, technical reports, audio/video cassettes, CD-ROMs and motion pictures. The quantum of work load can be estimated by the number of users and the number of volumes circulated (issued/returned) per day. The observation is that the number of users ranges between 5,000 to 10,000 in each of the six libraries except the library of IIT, Guwahati where number of users are about 2,000. The reason is that on one hand IIT, Guwahati got established in 1994 and is comparatively less developed in terms of number of students, teachers

and staff as well as number of disciplines of know ledge. Another factor behind less number of users is that industrialization is still in developing stage in North-Eastern region of India. Table 2.2 of this chapter reveals that the number of users are maximum in library of IIT, Mumbai (Bombay), next to this comes IIT, Chennai (Madras), then Kanpur, Delhi, and Kharagpur have almost same number of users and the library of IIT, Roorkee has below 5,000 users. Though this library is almost 150 years old but due to poor industrialization the number of visitors and corporate members is very less. Hence it may be concluded that the use of libraries has a direct relation to the industries in that region.

In chapter 3 system design for Automation is being covered. The considerations and steps involved in system designing have been narrated in the beginning, then general criteria for the selection of system, i.e. selection of Hardware, selection of software have been taken. Next to this the functions of specific activities as well as the files, directories, data elements and flow-charts are described. It has been concluded that instead of Batch mode on-line data entry and searching has to be preferred, on-line processing is found less complicated, more useful and results into speedy processing. Under chapter 4 the systems available in the seven IIT libraries are studied. It has been analysed that there is a lot of variation in hardware installed, software used and humanware deployed for automating the activities of different IIT Libraries. The libraries of IITs have atleast one mainframe plus varied number of PCs. IIT Kanpur has one Compaq Prollant and 25 PCs of Zenith and Wipro; IIT Delhi has 1 Compaq, 5 IBM and 5 PCL plus 37 PCs with 4 servers exclusively for library; Library of IIT, Chennai has 1 mainframe with 24 terminals and 20 PCs; IIT, Mumbai library has 1 Maxman Pentium mainframe with 22 terminals and 17 PCs; Library of IIT, Kharagpur has HCL-HP, PCL and Meteer-III with 16 terminals and 12 PCs; IIT, Guwahati library possesses IBM, HCL and Compaq and 13 PCs; and library of IIT, Roorkee has 21 Pentium with number of terminals. It can be concluded that to manage the work of

large library systems as that of IIT libraries besides one mainframe computer with number of terminals several PCs are also needed. It is also found that Compaq is owned by libraries of IIT, Kanpur, Delhi and Guwahati and it can be concluded that compaq is most suited hardware for large libraries. The software used by the libraries of IITs also have lot of variations. The library of IIT, Kanpur developed a fully integrated package entitled "iit KLAS". This package is developed on ORACLE RDBMS 7.0 Version. It has various modules such as "Lekhya" for acquisition, 'Suchi' for cataloguing, 'Patrika' for serial control and circulation etc. It is functioning efficiently for last over 7 years. The library of IIT, Delhi first developed its own program package 'LIS' in C^{++} language for housekeeping routines and used micro CDS/ISIS for Information Storage and Retrieval. In 1998 they bought 'LIBSYS' and since then using it successfully for all the activities of this library. 'LIBSYS' is installed on Windows NT Server. The library of IIT, Mumbai also developed their software packages, using 'FoxPro', under the names 'Pustak' and 'Purti'. For serial control when experiments for developing its own software were found unsatisfactory then in 1990 a software package named, 'SLIM' was bought and used successfully. The library of IIT, Roorkee uses "Troodon, a software developed on Window. The libraries of IIT, Kharagpur and Guwahati are working on 'LIBSYS'. Thus it can be safety concluded that out of several program packages 'LIBSYS' is most suitable in large libraries.

The study of humanware under chapter 4 reveals that the library of IIT, Kanpur got his all 33 professionals trained to work on computers. In the library of IIT Delhi 27 out of 36 technical staff had been trained to work on computers. The library of IIT, Mumbai has got his total technical staff trained to work with computers and is obliged to put its 39 staff members to operate the computers. The library of IIT, Kharagpur trained 35 out of its 53 staff members to work with computers. This study reveals that the libraries of seven IITs have trained almost

whole of their professional staff and about 60% of the staff are working on computers.

Cost-benefit analysis was a task tough to perform because the data desired to assess the benefits, in particular, was never calculated by the respondents. As such calculating benefits in a non-productive organisation like libraries is a tedious task .The benefits are both tangible and intangible and intangible benefits could not be calculated in terms of money instead they have to be assessed by the satisfaction of users and staff. The costs can be assessed upto great extent. The cost of hardware installed, maintenance charges, money involved on training of staff, cost of software, recurring charges like telephone and electricity bills all can be calculated. Though, most of the questions relating to cost-benefit analysis have been responded but the answers were not upto the mark. The responses from IIT, Mumbai library can be called to be the most relevant one and so the data provided by this library was used as the basis. It was calculated that on a cost of Rs. 17,39,000/- there is a recurring benefit of Rs. 6,00,000 per year. Besides these tangible benefits number of intangible benefits were also observed. The library of IIT, Chennai, though failed to give the exact figures on costs of computerisation but the approx. assessment comes to Rs. 15,00,000. The benefits on the basis of saving of staff the tangible benefits, are calculated to Rs. 3,00,000 per annum. The library of IIT, Kharagpur could not provide any data relating to tangible costs or benefits, but the intangible benefits are there. IIT, Delhi library reported the costs as Rs. 18,00,000 but it failed to give any figures of savings on staff or time. However, the details of new services introduced after computerisation without additional staff makes it evident that there is a saving of atleast 25% on staff. This comes to around Rs. 4,00,000 saving per annum. IIT, Guwahati library reported the costs involved to Rs. 10,000,00 and the benefits, recurring and intangible, obtained by about 50% savings on staff is nearly Rs. 3,00,000 per annum.

It can be concluded that white the costs of computerisation range from 15 to 22 lacs as non-recurring and about Rs. 2 lacs as recurring, the tangible recurring benefits range 3 to 5 lacs per annum. Besides the tangible benefits, the savings of mental fatigue to the users and staff, economy of time in providing excellent and efficient services and sense of satisfaction among the library staff and users are the intangible benefits.

At the end it can be concluded that the libraries having large collection, say above 50,000 volumes, and well trained staff should go invariably for computerisation. If financial constraints do not put a hurdle then LIBSYS software should be bought, otherwise they can develop their own a program package 'SOUL developed and made available by INFLIBNET can also be purchased and used. Initially the benefits of computerisation may not be realised but the costs involved in automation would be paid back in manifolds in the course of time.

Suggestions

On the basis of the study the following suggestions are being made-

(1) All the libraries which have a suitable infrastructure for automation should use computers for their routine jobs.

(2) The selection of Hardware and Software has to be made carefully considering the quantum of work and available resources.

(3) Keeping in mind the experience of IIT Libraries, it is suggested that the other Libraries should opt for a software package instead of developing the one in-house.

(4) All the staff member working in Library have to be trained to work on computer. The Libraries already automated should training programmes for other professionals.

(5) Since the cost of computerisation is high it is suggested that the small and medium sized Libraries share the computers on co-operative basis.

(6) The Libraries of all the seven IITs should come together to have a common data base of their literature to share the resources. They should also have a joint bibliographical data base.

Suggestion for Future Research

This study may prove to be useful for research in the following areas –

(1) The system being used by the Libraries of other important organisations like ONGC, BHEL, DRDO etc may be studied and compared.

(2) A study may be carried out to find the suitability of Various software packages available for use in Libraries.

(3) Analysis of qualification of Library staff may be done and on this basis the type of training necessary for automating Library's work and services may be assessed.

(4) The cost – benefit analysis of automating various Libraries may be made .

(5) Estimation of benefits of Library Servises is a difficult task , new methods may be searched to calculate the benefits.

QUESTIONNAIRE

Automation In The Libraries Of Indian Institute Of Technology

A) BASIC INFORMATION

1. Name of the Library/Parent Institute ....

2. Year of Establishment   a) Parent Institute ....
                                   b) Central Library.......................

3. Name of the Librarian ....

4. Details of Documents' collection (Please, latest available data only)
   a. Books ....
   b. Current Periodicals Received ....

       b –1.) No. of Titles subscribed to ....
       b – 2.) No. of Titles received as gratis ....

   c. Back volumes (Bound) of the periodicals ....

   d. Standard/Patents (Pamphlets) etc. ....

   e. Micro forms :

       e-1) Micro films ....
       e-2) Micro cards ....
       e-3) Micro fiches ....

   f. Technical Reports ....

   g. Others (Please specify Video Cassettes, Motion Pictures, CD-ROM etc.) ....

5. Number of Users :   1999-2000   2000-2001

   a) Under Graduate (UG) students.............................
   b) Post Graduate (PG) students ....
   c) Research scholars   ....
   d) Teaching faculty   ....
   e) Non-teaching staff   ....
   f) Visitors(Temporary users who...........................
       belong to other organisations),
       approx.

6. Library Staff – (Kindly give only number under each category)

a) Technical/Professional (Having Degree/Diploma in Library Science ....

b) Semi-technical (Mechanics/Operators etc.) ....

c) Ministerial (Clerks, Typists etc.) ....

d) Attendants/Peons/Sweepers etc. ....

7. Section/Units/Deptt. of the Central Library (Based upon the functional organization of each) ....

B. COMPUTER SYSTEMS IN THE LIBRARY :

1. Availability of computer system(s) ....

   a) Library has computer system(s) of its own   Yes/No

   b) If no, does the Library has access to any other computer system (situated elsewhere in the Institute)   Yes/No

2. *Computer Hardware :*
   a) Trade name(s) of the computer system(s) ....
   b) Type of computer(s) - PC/Micro/Main-frame/Super/Any other (please specify) ....
   c) Number of Terminals available in the Library ....
   d) Specifications of the computer system –

   1) Word length   ....
   2) Processing speed   ....
   3) Memory (Internal)   ....
   4) Input/Output devices ....
   5) Printer
       5.1) Type-Dot Matrix/Laser/Any other (Please specify).......
       5.2) Speed........Characters/Lines/Pages per second/Minutes

3. *Computer Software :*
   a) Software developed locally/program-packages adopted in Toto/program packages modified and adopted ....
   b) Name(s) of the programme package(s) used..................
   c) Language(s) used in the programme ....
   d) Kindly highlight the specifications, in brief, of the Software used ....
   ....
   ....
   ....

4. *Humanware :*

   a) Number of staff actively engaged in working with computers

a-1) System Manager/System analyst ....

a-2) Operators ....

a-3) Library staff trained to work with computer (if yes, please give the number

b) Readers allowed to handle the computer system(s) of the central library – Yes/No

c) If 'b' is yes, then for which services (kindly name) ....

5. COMPUTERISATION :

1) Library has been automated –   Yes/No

2) If yes, automated fully/partially ....

3) Activities already automated (Kindly tick ✓ the activities already under automated operation

a) House keeping routine-Book Acquisition/Circulation control /Serial control/Cataloguing/Classification/Indexing etc./Any other, please specify ....

b) Information storage & Retrieval services ....

b-1) Current-CAS/SDI/Reference Service/Any other ....

b-2) Retrospective-Bibliographical/any other ....

b-3) Services – On-Line/Off Line

4. System Design i.e. the names of files and modules used for each

of the activities being automated.....................................

(Please attach separate sheet if the space provided is insufficient)

a) Circulation -   i) Files ....
                     ii) Modules ....

b) Acquisition of documents (other than serials)
                     i) Files ....
                     ii) Modules ....

c) Serial control - i) Files ....
                     ii) Modules ....

d) Technical processing (Cataloguing & Classification)
                     i) Files ....
                     ii) Modules ....

e) Information services
                     i) Files ....
                     ii) Modules ....

5. NETWORKING

a) If networking is done for any of the activities being automated-
$\hspace{8cm}$ Yes/No

b) If yes, please give particulars (i.e. the centres included, Type of Networking etc.) ....

c) Please give particulars of the future plans, if any, of the computerised networking under Resources Sharing Programme etc. ....

6. Future plans of Automation : (Please name the activities)

a) Activities already planned ....

b) Activities under planning ....

c) Infra-structure (i.e. computer system, programme packages and/or staff) needed for further automation ....

D) USER'S REACTION'S :

1. Library Staff :

a) The percentage of total staff actually associated with working on computer system ....

b) Library staff working on computer system find the system and its functioning (Please✓) Excellent/Good/Satisfactory/Poor

c) Library staff not working on computer system find it and its applications – Very useful/Useful/Satisfactory/Useless burden upon the library and its staff (Please ✓)

d) Library staff feel that the computerisation has made their work simpler and more convenient -
$\hspace{6cm}$ Yes/No

2. Readers (Includes Teaching faculty, Research scholars, PG & UG student and non-teaching staff etc. of the Institute:.................

a) Your clients find the computerized library services- Excellent /Good/Satisfactory/Useless at all (Please ✓)

b) Do they take interest in knowing more about computer and its functioning –
$\hspace{6cm}$ Yes/No

c) Do they operate the system -
$\hspace{6cm}$ Yes/No

d) Do they wish to operate the system on their own -
$\hspace{3cm}$ Yes/No

e) Readers feel that computerization has made library services more efficient, accurate and prompt -
$\hspace{4cm}$ Yes/No

E) COST-BENEFIT ANALYSIS

1. Computer system(s) installed in central library during the year (if library has got only terminal(s) from a Mainframe system, installed in some other department, please mention the year in which the terminals were installed in the library)...................

2. Cost of Automation :

a) Installation cost of computer system (if system being installed in several phases, kindly give consolidated cost) – Rs. ....

b) Cost of peripherals (If not included in (a) above) and Infrastructure (i.e. separate building/rooms constructed, Air-condition etc.) Rs. ....

c) Additional expenditure on Man-Power Development :
   c-1) Cost of Training the existing staff of the library Rs......
   c-2) Total salaries/annum of new recruits (exclusively for library automation), if any Rs..............................

d) Recurring maintenance cost (Per annum)
   d-1) After sale service fee Rs. ....
   d-2) Computer stationery Rs. ....
   d-3) Air conditioning maintenance and power charges Rs. ....
   d-4) Any other (Please specify) ....

3. Economy in Number of library staff (other than class IV)

SECTION (ACTIVITIES)		NUMBER OF STAFF MEMBERS	
		Pre-automation	Post-automation
a)	Book acquisition section (ordering passing the bills, accessioning etc. job)		
b)	Technical processing section (Classification, Cataloguing, Shelf-list preparation etc. jobs)		
c)	Circulation section (Membership, Charging-discharging of books reminders, over-due fines etc. jobs)		
d)	Periodicals section (Subscription, reminders and overall control of current & Back vols. of Serials)		
e)	Reference and Documentation Section (Information services)		
f)	Any others (Please specify)		

4. Economy in Time   Approx. Time involved (in hrs.)

	ACTIVITY	MANUAL OPERATION	COMPUTERIZED OPERATION
a)	Placing order for 100 documents (other than serials)		
b)	From receipt of 100 new documents in the library to their accessioning.		
c)	Cataloguing of 1000 vol. of Monographs		
d)	Classification of 1000 vol. of Monographs		
e)	Circulation (Charging/ Discharging of 1000 vol.		
f)	Recording the receipt of current journals and sending reminders for non-receipts per-day.		
g)	Short-Range Information/ Reference services to 100 users.		
h)	Preparation of 10 Documentation lists/select -ed Bibliographies.		
i)	Any other computerized activities (Please specify)		

5. Kindly give details of the new services if any, being introduced by the Library after automation ....
....
....

F) COMMENTS & VIEWS :
   (Please feel free to give your experiences, option and comments regarding computerization of your Library) ....
....
....

Dated :

Kindly Return –

To,   (Signature of Respondent)
V.P. Khare   Name :
289, Subhash Ganj,   Position :
Jhansi – City (U.P.) 284 002

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